

**ONTARIO
HORTICULTURAL CROPS
RESEARCH & SERVICES COMMITTEE**

**2000 ANNUAL REPORT
TO**

**ONTARIO AGRICULTURAL SERVICES
COORDINATING COMMITTEE**

JANUARY 04, 2001

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OHCRSC EXECUTIVE SUMMARY

The 2000 report of the OHCRSC provides a comprehensive overview of the status of the horticulture industry in Ontario. There are many notable accomplishments that have been reported this year. I would encourage all government and industry organizations to make sure that individuals within your organization are aware of this report and its availability on the Education and Research section of the OMAFRA website at www.gov.on.ca/omafra

With only a few exceptions, subcommittee meetings were well attended with balanced representation from growers, industry members, research personnel and extension specialists. As a result of discussion with the subcommittee chairs and members of the main committee, the OHCRSC will seek additional industry representation to participate on the main committee in 2001.

In total 68 recommendations were put forward by the subcommittees. This is considerably higher than in previous years. Some further discussions will be undertaken with subcommittee chairs to provide further clarification on identification of issues, priorities and recommendations.

Approximately 22 of the 68 recommendations were forwarded to the OPMRSC. As the dates of the OHCRSC and the OPMRSC were held within the same week this year, it was not possible for OPMRSC to address each subcommittee recommendation. There was good discussion on the broader issues and trends in including pesticide registration needs, development of pest management strategies, funding for minor use registration and GLP certification, pesticide harmonization and staffing of research positions and extension positions. The OHCRSC will forward the individual subcommittee recommendations to the agencies identified for further response. This process may have to be reviewed in the future.

The need for additional research on nutrient management was a high priority recommendation that was reported across many commodities. Due to the number of horticultural commodities and the identified lack of nutrient management recommendations for horticultural crops, the OHCRSC would urge the ARIIO to consider providing new funding resources to address this priority.

There were also a large number of recommendations put forward that dealt with staffing of research and extension positions at federal and provincial governments and universities. The OHCRSC would encourage all the institutions involved to consider the needs that have been identified. It was clearly communicated by the subcommittees that we are losing a great deal of expertise through retirements or organizational changes. Consultation and dialogue with the commodity groups on these issues is encouraged.

We will continue to work towards our goal of getting responses to all the recommendations put forward by the subcommittees as it is important feedback and it reinforces the responsiveness of the OASCC system. It is generally recognized that progress is being made on the priorities year to year, but confirmation of that by way of formal responses is appreciated.

I would like to thank each of the subcommittee chairs for their commitment to this process. Many hours have gone into the organization of the subcommittee meetings and the preparation of the final reports including the identification of minor use priorities and special research fund criteria. It is only through the dedication of these individuals that we are able to compile this comprehensive document that will be used to impact the direction of research and service priorities for the horticulture industry in Ontario.

At the time of printing, the grape and wine subcommittee report was unavailable. This will be provided as a supplement to the final report and added to the website when it is available.

I would also like to thank Stuart Budd and Paul Brine, Research Analysts with Innovation and Risk Management Branch for their ongoing support working with the subcommittees and the main committee.

A special note of thanks to Jennifer Daley, OMAFRA Crop Technology who took on the daunting task of compiling this report.

Preparations are underway by the OHCRSC to begin the process to undertake the Strategic Planning Process for 2001. It seems quite appropriate as we enter the new millennium that we invest some time and energy into where the Ontario horticulture industry needs to be in the next five years and what we need to get there.

Submitted on behalf of the OHCRSC,

Annette Anderson
Chair

INTRODUCTION

The Ontario Horticultural Crops Research & Services Committee (OHCRC) is one of nine committees (Animal, Field Crops, Horticultural Crops, Food Processing, Rural Development, Agriculture and Food Engineering, Agricultural Economics, Pest Management, Soil Water and Air) reporting to the Ontario Agricultural Services Co-ordinating Committee (OASCC).

The OHCRC endeavours to compile the thoughts and activities of 16 commodity subcommittees with 2 additional working groups. They are:

Agroforestry
Apiculture & Pollination
Apple
Berry Crops
Crucifer Crops
Ginseng
Grape & Wine
Greenhouse and Protected Crops¹
Greenhouse Floriculture
Low Acreage & Special Crops²
Muck Crops
Nursery/Landscape & Turfgrass
Potato
Sweet Corn
Tender Fruit
Tomatoes

Working Groups

1. Mushrooms
2. Asparagus

The membership is made up of industry, government and universities representatives. The main OHCRC is made up of 14 members with an additional 400 members making up the subcommittees. Horticultural Crops, through its subcommittees, identifies and prioritizes research needs for crop production, including pest management, and makes recommendations to address research gaps, re-allocation of support or re-direction of current research effort.

MANDATE

Main Committee:

- ❑ To review reports submitted by commodity committees.
- ❑ To assess the requirements for horticultural crops research and services.
- ❑ To establish priorities for horticultural crops research and services.
- ❑ To assess progress in horticultural crops research and services.
- ❑ To present reports and recommendations to OASCC describing the needs for horticultural crops research and services including information in relation to:
 - cost-benefit;
 - research and service facilities and personnel required in the investigation(s);
 - location best suited for the investigation(s);
 - how funds might be obtained or freed to conduct new research and services;
 - operation of subcommittees.
- ❑ To consider and approve chairs, vice-chairs and members of subcommittees.

Terms of Reference:

- To prepare research and service summaries and to recommend research and services priorities in Ontario for appropriate horticultural crops.
- To disclose problems that face the appropriate industry which require investigations.
- To coordinate research and services planning and cooperation.
- To assess and suggest priorities for new programs and recommend which programs presently underway should be expanded or terminated.
- To estimate, where possible, costs involved in the conduct of new research and services programs and to supply cost-benefit information.
- To suggest, where possible, how funds might be obtained or freed to conduct new research and development.

OASCC STRUCTURE, DUTIES AND TERMS OF REFERENCE

ONTARIO AGRICULTURAL SERVICES COORDINATING COMMITTEE

A provincial committee, the Ontario Agricultural Services Coordinating Committee (OASCC) was formed in 1965, with four major subcommittees, namely, Field Crops, Horticultural Crops, Livestock, and Soil and Water. Later, four new major subcommittees were added: Agricultural Economics, Agricultural Engineering, Food, and Pest Control. In 1986 "and Services" was added to the names of all the major subcommittees, and two names were changed to reflect more closely the scope of their activities. A new mandate and structure for the Food Research and Services Committee was approved in January 1990, and in 1993 its name was changed to the Ontario Food Processing Research and Services Committee. In 1998-99 OASCC was restructured again to include the following 9 OASCC committees - Animal, Field Crops, Horticultural Crops, Food Processing, Rural Development, Agriculture and Food Engineering, Agricultural Economics, Pest Management, Soil Water and Air.

OASCC Terms of Reference

1. Regular review of the broad aspects of agri-food and rural research, extension, and education in Ontario with the object of:
 - a) facilitating intergroup communication and coordination at management levels;
 - b) assessing immediate and future needs and developing proposals to meet them;
 - c) advising on joint uses of available facilities and personnel; and
 - d) contributing information and ideas bearing on regional and national policies affecting agri-food industry.
2. To carry out special assignments on behalf of CARC appropriate to the above objectives.
3. To meet at least annually and to report through a designated representative to the annual meeting of CARC. Summary reports shall be sent to the Chair of CARC with copies to the Deputy Minister of Agriculture, Food and Rural Affairs for Ontario.

ONTARIO AGRICULTURAL SERVICES CO-ORDINATING COMMITTEE

Ontario Animal Research & Services Committee

Aquaculture
Beef
Broiler
Dairy
Deer
Egg Layer
Equine
Fur Bearing
Goat
Pork
Sheep
Turkey

Ontario Field Crops Research & Services Committee

Cereal Crops*
Corn*
Forage Crops*
Oil & Protein Seed*
Pulse*
Tobacco*

Ontario Agriculture & Food Engineering Research & Services Committee

Crops
Food
Livestock
Rural Environment

Ontario Soil, Water & Air Research & Services Committee

Agrometeorology*
Soil Management*
Water Management

* includes technical working groups

Ontario Horticultural Crops Research & Services Committee

Agroforestry
Apiculture & Pollination
Apple
Berry Crops
Crucifer Crops
Ginseng
Grape & Wine
Greenhouse & Protected Crops*
Greenhouse Floriculture
Low Acreage & Special Crops*
Muck Crops
Nursery/Landscape & Turfgrass
Potato
Sweet Corn
Tender Fruit
Tomatoes

Ontario Food Processing Research & Services Committee

Dairy Products & Processing
Fruit & Vegetable Products & Processing
Cereal Grains & Oilseeds Products &
Processing
Meat Products & Processing

Ontario Agricultural Economics Research & Services Committee

Ontario Pest Management Research & Services Committee

Technical Working Groups
Fruit Vegetables Tobacco & Ginseng Field
Crops
Protected Crops Ornamentals & Turf
Ontario Weed Committee

Ontario Rural Research & Services Committee

INDUSTRY/SECTOR SCAN

MAJOR ACCOMPLISHMENTS

AGROFORESTRY

Significant Research and Service Accomplishments

University of Guelph - Agroforestry Research Group

Submitted by: Naresh Thevathasan, University of Guelph

Completed Thesis Titles (M.Sc.)

- ◆ Richard Gray. 2000. Root Distribution of Hybrid Poplar in the Temperate Agroforestry Intercropping System. 116 pp.

Refereed Articles

- ◆ Oelbermann, M and A.M. Gordon. 2000. Quantity and Quality of Autumnal Litterfall into a Rehabilitated Agricultural Steam. J. Envir. Qual. 29: 603-611.
- ◆ Thevathasan, N.V., A.M. Gordon and G. Price. 2000. Biophysical and Ecological Interactions in a Temperate Tree-based Intercropping System in Southern Ontario, Canada. p. 49-60. In: Sustaining agriculture in the 21st Century. Proceedings of the 4th Biennial Meeting North American Chapter. International Farming Systems Association. 342 pp.
- ◆ Oelbermann, M. and A. M. Gordon. 2000. Enhancing Wildlife and Water Quality in an Agricultural Landscape. A Case study of Riparian Buffer Zone Rehabilitation, p. 37-48: In Sustaining Agriculture in the 21st Century. Proceedings of the 4th Biennial Meeting North American Chapter. International Farming Systems Association. 342 pp.

Manuscripts in Preparation to be submitted to Refereed Journals

- ◆ Thevathasan, N.V., A.M. Gordon, G.W. Price and P.E. Reynolds..... Promoting the Stewardship of Soil and Water Resources through Biophysical and Ecological Interactions in a Temperate Tree-based Intercropping System in Southern Ontario. Canada. Ecosystem (Submitted).
- ◆ Zhang, P. and A.M. Gordon..... Nutrient inputs through hydraulic pathways and Litterfall in a Temperate Tree-Based Intercropping system in Southern Ontario. Canada.
- ◆ Simpson, J. A., P. Reynolds and A. M. Gordon..... Competitive Interactions and Their Effects on Maize and Soybean Productivity in a Tree-based Intercropping System in Southern Ontario. Canada.

- ◆ Price, G.W. and A.M. Gordon... Image Analysis Methodology for Rapid field Earthworm Burrow Estimates in Soil Profiles under a Temperate Poplar Intercropping System. Agroforestry Systems (Submitted).

Abstracts

- ◆ Oelbermann, M., R.P. Voroney and A. M. Gordon. 2000. Elemental Leaching of Populous spp. Leaves Collected in Litter Traps in the North Temperate Zone. ASA, CSSA, SSSA Meeting, Indianapolis, U.S.A.
- ◆ Thevathasan, N. and A.M. Gordon. 2000. Intercropping Trees with Crops. Newsletter. Eco-Farm and Garden.

Posters

- ◆ Price, G.W., and A.M. Gordon. 2000. Special and Temporal Distribution of Earthworms in a White Ash, Silver Maple, Poplar Intercrop in Southern Ontario. Canada. College Royal 2000. University of Guelph.
- ◆ Price, G.W., and A. M. Gordon. 2000. Effects of Tree-Based Landuse Systems on Earthworm Populations. International Plowing Match. 2000.

Other Activities

Several tours for delegates from China, Sri-Lanka, Japan and Ghana were conducted in the past year. Also, several field tours for local delegates were also conducted (e.g. CRESTech members, Grand River Conservation Authority etc.)

Ontario Soil and Crop Improvement Association

*Submitted by: Andrew Graham, Stewardship Programs Coordinator,
Ontario Soil and Crop Improvement Association (OSCIA)*

Reports Available from OSCIA:

- ◆ Environmental Farm Plan Indicator Study. 2000.
University of Guelph.
School of Rural Planning and development.
- ◆ Restoration of the American Chestnut-Farm Response to a Species at Risk. 2000.
A Demonstration Project.
Ontario Soil and Crop Improvement Association.
- ◆ Wildlife Impact Assessment for Ontario Agriculture. 2000.
Ontario Soil and Crop Improvement Association.
- ◆ Evaluation of Buffer Projects along Watercourses on Ontario Farms. 2000.
Ontario Soil and Crop Improvement Association.

The above referenced reports are available from the Ontario Soil and Crop Improvement Association.

Eastern Ontario Model Forest:

Submitted by: Brian Barkley, General Manager, Eastern Ontario Model Forest

- ◆ Survey of Farmers, Ranchers and Rural Landowners-Attitudes and Behaviours Regarding Land Stewardship 2000. Information Report # 48.
- ◆ Introduction to Sustainable Forest Certification. 2000. Information Report #49.

The above referenced reports are available from the Eastern Ontario Model Forest office in Kemptville.

Ministry of Natural Resources

*Submitted by: Eric Boysen, Policy Advisor, Private Land Forestry
Ministry of Natural Resources*

Publications Available:

- ◆ Silvicultural Guide for Managing Southern Ontario Hardwoods. 2000.
Ontario Ministry of Natural Resources.

Extension Services:

The Ministry of Natural Resources supports many extension courses and workshops geared towards farmers and rural landowners.

A tree marking certificate course is offered annually at the Forst Centre in Dorset (certified tree markers are a requirement on public land.). A southern Ontario version of the tree-marking course is offered near Turkey Point Provincial Park to deal with more southern issues. The tree marking training courses are designed to implement the recommendations of the new Silvicultural Guide to Managing Southern Ontario Forests. Tree marking courses are designed to implement the recommendations contained in the manual, which defines proper forestry practices and improve forestry practices.

The Ministry of Natural Resources continues to sponsor or participate in woodlot events such as the Outdoor Farm Show, the International Plowing Match, the Hastings Plowing Match and regional Woodlot Conferences in Kemptville and Trenton.

Individual Stewardship Councils offer local training and workshop opportunities for landowners.

The Forest Gene Conservation Association organized and delivered four seed collection and handling workshops, training about 100 people on proper techniques. Prescribed techniques aim to ensure seed source control and genetic integrity.

The 24th Annual Forest Health Review was held in Orillia. Agroforestry pests discussed included Plum Pox, Pine Shoot Beetle, West Nile Virus, and Asian Long-Horned Beetle.

Ministry of Agriculture, Food and Rural Affairs:

Submitted by: Dave Chapeskie, Agroforestry Specialist, OMAFRA

Publications Available:

- ◆ Report on Economics of Maple Syrup Production. 2000. Ontario Ministry of Agriculture, Food and Rural Affairs and the Canadian Farm Business Management Council.
- ◆ Effects of Ice Storm Damage and other Stressors on Sugar Bush Health and Sap Productivity-Literature Review and Synthesis. Coons, C.F., 2000. Ontario Ministry of Agriculture, Food and Rural Affairs. ISBN 1-896392-63-6.
- ◆ Impact of the 1998 Ice Storm on Sugar Bushes and Summary Management Recommendations. Chapeskie, D. 2000. Ontario Ministry of Agriculture, Food and Rural Affairs. Extension Note. ISBN 1-896392-66-0.
- ◆ Tapping and Sap Collection Techniques in Ice-Damaged Sugar Bushes. Chapeskie, D. 2000. Ontario Ministry of Agriculture, Food and Rural Affairs. Extension Note. ISBN 1-896392-67-9.
- ◆ Harvesting and Maintenance in Ice-Damaged Sugar Bushes. Richardson, M. 2000. Ontario Ministry of Agriculture, Food and Rural Affairs. Extension Note. ISBN 1-896392-68-7.
- ◆ Operating to Minimize Ice Storm Impacts on Tree Health. Richardson, M. 2000. Ontario Ministry of Agriculture, Food and Rural Affairs. Extension Note ISBN 1-896392-69-5.
- ◆ Protection of Ice-Damaged Sugar Bushes. Richardson, M. 2000. Ontario Ministry of Agriculture, Food and Rural Affairs. Extension Note. ISBN 1-896392-70-9.
- ◆ Determining the Nutritional Health of Sugar Bushes and the Role of Fertilization and Liming. Wheeler A. 2000. Ontario Ministry of Agriculture, Food and Rural Affairs. Extension Note ISBN 1-896392-71-7.
- ◆ The above referenced publications are available from The Ontario Maple Syrup Producers' Association - Promotion store.

Ice Storm Survey and Research Information:

- ◆ 1998 Ice Storm Maple Producers assistance survey. 2000. University of Guelph.
- ◆ International Ice Storm Conference. 2000. Ministry of Natural Resources, Carleton University.

Agroforestry Brochure :

- ◆ Ontario's Agroforestry Program. Bringing the Resources of the World to Rural Ontario. Revised 2000.

This brochure summarizes key resources available to farmers and other woodlot owners in eastern Ontario. Important information available on various aspects of agroforestry is described in this brochure e.g. maple industry, christmas tree industry, farm woodlots, windbreaks, shelterbelts and stream buffers. The brochure is updated annually.

This brochure can be obtained from the Ministry of Agriculture, Food and Rural Affairs.

Study Courses Reviewed:

- ◆ Independent Study /OAC ACCESS Course Conserving Woodlands. Hiltz, S. 2000. Centre for Land and Water Stewardship. University of Guelph.
- ◆ New Agroforestry Curriculum Documents. Moncton University, Edmunston, New Brunswick.

Maple Agriphone:

- ◆ OMAFRA is working to provide farmers with a number of different alternatives to access information related to commodities of interest to them. In 1999 and 2000 a province wide toll-free phone line was established for maple. During the maple season, maple producers and others can dial in a toll-free line and listen to a short pre-recorded informational message for maple. Emphasis has been placed on informing maple producers on the status of crop production in the different parts of the province. Other messages which pass on production tips and the results of applied research are provided as well. The Maple Agriphone has been popular with maple producers and will be continued in 2001.

Agroforestry Industry Exhibit:

- ◆ An agroforestry industry exhibit, which highlights the importance of the agroforestry industry in Ontario, was prepared in 2000. The exhibit is has a section for the maple industry and a section for other aspects of agroforestry. The exhibit was used at the International Plowing Match, the Outdoor Farm Show, Annual MNR Stewardship Conference and a number of other meetings in 2000. Staffing was provided for the agroforestry exhibit.

Other Agroforestry Activities:

Technical Presentations at Conferences

- ◆ Chapeskie, D.J. Maple Production School. 2000. Maple Orchards in Ontario. Cornell University.
- ◆ Chapeskie, D. J., International Ice Storm Conference. 2000. Ice Storm Assistance for Maple Producers and Christmas Tree Farmers in Eastern Ontario. Carleton University.
- ◆ Chapeskie, D. J., North American Maple Syrup Council Meeting. 2000. Use of Steam in the Production of Maple Products. Burlington, VT.
- ◆ Chapeskie, D. J., North American Maple Syrup Council Meeting. 2000. Sanitation and Cleaning of Maple Tubing. Burlington. VT.

Maintenance of Agroforestry Website:

A website is maintained with linkages to other important websites (e.g. site of the Ontario Maple Syrup Producers Association). The site address is:

<http://www.gov.on.ca/OMAFRA/english/crops/hort/agrofore.html>.

Extension- Advice and Information:

The Agroforestry Specialists provide technical and promotional support for a number of industry meetings (e.g. OMSPA Summer Maple Tour, OMPSA Local Information Days, SONG Field Trips etc). The Specialists also provide advice and information to a wide variety of clients on request.

APICULTURE & POLLINATION

Major Accomplishments in 2000.

I. University of Guelph

A. Integrated Management of Bee Mites (G. Otis)

1. Comparative Resistance of French and Ontario Bee Stocks to Parasitic Mites. Personal observations of beekeepers and researchers in France indicate that Varroa no longer has damaging effects on some bee stocks. A collaborative project between the University of Guelph and the Institute Nationale de la Recherche Agricole (Avignon, France) was established to determine the cause of the apparent resistance. Research apiaries in Ontario and Southern France with colonies headed by the same stocks of bees from the two countries were established. Bee colonies were infested with equal numbers of Varroa from the region of study. Samples of bees were taken from hives in October, 2000, after brood rearing had ceased and all bees had emerged. The numbers of varroa mites in the samples from colonies of the two geographic stocks did not differ at the Ontario location.

2. Size Influences Drone Fitness. Drone honeybees can develop in larger (6.0-6.9mm) drone cells or smaller (5.2-5.8mm) worker cells. Drones reared in drone cells are substantially larger than those reared in worker cells. Research was conducted to study the fitness of large drones in comparison to small drones. Preliminary analyses indicated that flight characteristics (e.g. number of mating flights per day, duration of mating flights) did not differ between drones of the two sizes on warm days. On cooler days near the threshold for drone flight, more large than small drones took mating flights. Small drones had substantially lower survival period than large drones in one colony, but equal mean longevity in the other. Numbers of sperm were positively correlated with drone weight, suggesting that large drones have more sperm.

B. Sustainable pollination for Ontario crops (P. Kevan)

1. Apple Pollination, Pollen & Gene Flow in High Density Orchards. For the field season 2000, the research program on apple pollination in high-density orchards was expanded to include orchards in Georgian Bay. Six isozymes were used to provide a genetic typification of 13 apple varieties. By examining the genotypes of the seeds, we have been able to map the extent of pollen movement in orchards. In general, pollen does not effectively move more than 3 or 4 rows, but can move as much as 18 rows. Pollen moved from 2 or 3 to as much as 7 trees along rows. No differences in pollen dispersal distances were attributed to placement of beehives. Those results have profound implications for orchard design. Clearly, block plantings

of single varieties in more than 4 rows can result in diminished pollen flow, poor flower fertility and low quality apples. An unexpected finding was that flowers fertilized by pollen of more than one other variety tend to produce better fruits than similarly well-pollinated flowers with pollen of a single variety.

2. Field Cucumbers and Pollinator Deployment for Hand & Machine Harvest. In 2000, research on pickling cucumber fields near Simcoe showed that honey bees placed on fields distributed throughout the field whether or not the hives were placed together, or arrayed along the field-edge in groups of two. However, there was a decline in activity at 400 meters, activity was half that close to the hives (ca. 10 m). Honeybee foraging was consistent within years for the six different cucumber cultivars (FancyPak, FancyPak-M, Vlasset, Score, Regent, Patton). Bee foraging activity was greatest between 12:00 and 1:00. Machine harvested pickling cucumbers demands a much narrower temporal window for flowering and pollination (perhaps as little as four days). To make for greater uniformity of cucumber size, high intensity of pollination is required. Survey of wild pollinators in 1999 and 2000 indicated that wild pollinators are very scarce on most cucumber fields.

In 1999, genetic variability among 18 cultivars of pickling cucumbers using the fingerprinting of MPI and 6PGD enzymes was found. At least 70% of pollination on pickling cucumber fields was from inter-varietal cross-pollination. The remaining 30% may be inter-varietal or intra-varietal cross-pollination that we could not be identified. Preliminary 2000 results suggest that the impact of the pollinizer varieties was rather small and that intra-varietal pollination is the more important process in fruit set.

3. Hothouse Tomatoes & Bumblebees. Research in commercial tomato greenhouses has shown that the levels of pollinating activities of bumblebees varied in relation to hothouse environmental factors. Plastics that allow greater amounts of ultraviolet light to enter into the environment of the hothouse are more likely to cause greater activity of the bumblebees. The effectiveness of the number of bumblebee visits to tomato flowers can be predicted by examining flowers for mandibular bruising. The degree of bruising caused by *B. impatiens* visits is less per visit than by *B. terrestris* in Europe. Thus, growers can be satisfied if they see only slight bruising on the flowers rather than the dark, heavy bruising that indicates adequate pollination in Europe. In certain situations, tomatoes are being over-pollinated.

4. Squash, Pumpkin & the Hoary Squash Bee. For the field season 2000, a survey was continued to find the distribution of the squash bee, *Peponapis pruinosa* in Ontario and to provide recommendation to squash and pumpkin growers about how to conserve populations of this bee on their farms. This bee is well distributed throughout southern Ontario. It is not present north of Ottawa, north of Peterborough, nor on Manitoulin Island. The nests are typically around 30 cm below the soil surface. At the bottom, the nest contains from 10 to 15 cells, with the top-most cell about 5 cm below the surface. Pollen provisions are always pure squash or pumpkin pollen. Thus, deep ploughing is not recommended because it will cause destruction of the nests.

5. Highbush Blueberry and Pollination. In the field season 2000, more information was gathered on the floral sizes of highbush blueberry varieties grown in Ontario. It is clear that some

varieties with particularly narrow openings to the flowers, and deep-tubular flowers, cannot be pollinated by honeybees. Other varieties with short or more widely open flowers are well visited by honeybees. The pollination of high bush blueberry is best achieved by vibratile pollinators.

6. Sweet Corn & HoneyBees. A report to explain the issues that surround the problem of poisoning honeybees by pesticides used on sweet corn in Southern Ontario was prepared for OMAFRA. The report considered the corn plant and its biology followed by relevant aspects of honeybee biology. The insecticide applications on sweet corn with regard to pest control and potential hazards to honeybees were also considered before concluding with some recommendations that should be acceptable, perhaps with modifications, to sweet corn growers, aerial applicators of insecticides, and beekeepers.

7. Bees as Vectors of Biocontrol Agents. Lygus bugs have become a major pest affecting canola. In 1999-2000 application of a novel biocontrol technology, using pollinating honeybees to deliver entomopathogenic biocontrol, e.g. *Beauveria bassiana* and *Metarhizium*, as agents to help suppress the Lygus problem on canola was studied. Laboratory studies showed that *Beauveria* does not seem to be detrimental to honey bees. For 2001-2002 we propose to test the bio-delivery system on canola. Thus, the beekeepers would benefit from offering an additional and special service to growers.

8. Pollinator Declines and Economics of Pollination Initiative: Professor Kevan has been extensively involved in issues concerning the recognized problems of pollinator declines around the world. He has traveled to USA, Thailand, Brazil, and Italy in the past two years to various workshops, symposia, and congresses. This Initiative has come from the Forgotten Pollinators Campaign (USA), the Convention on Biodiversity (Brazil and Italy), the North American Pollinators Protection Campaign (USA), the National Fish & Wildlife Association (USA), The Food and Agriculture Organization of the United Nations (Italy), International Bee Research Association (UK) and the Entomological Societies of America, Canada, and the International Entomological Congress (Brazil). The main issue of this Initiative is to study the potential of declining pollinators on food production and food prices.

II. Ontario Beekeepers' Association Tech-Transfer Program

A. Breeding, Maintenance and Marketing of Parasitic Mite Resistant Honey Bee Stocks (M. Nasr)

1. Maintenance of tracheal mite-resistant honeybee stocks: Ontario bee breeders selected potential breeder queens from the 1999 generation. The offspring of 175 queens were evaluated for tracheal mite resistance using the tracheal mite resistance bioassay. The 25% of bee colonies that had the lowest abundance and prevalence of tracheal mites in the resistance bioassay, were selected as the mite resistant stock. These colonies were recommended to use their queens as breeder queens to produce the 2001 generation of the Tracheal Mite Resistant-Hygienic stock.

2. Breeding and Amalgamation of the Hygienic Trait into the Tracheal Mite-resistant HoneyBee Stocks. Over 200 colonies from the 1999 Tracheal Mite Resistant-Hygienic bees in Ontario were evaluated for hygienic behaviour in 2000. The liquid nitrogen freeze-killed pupae

assay was used. Honeybee colonies which removed more than 50% of the freeze killed pupae, were recommended for use to produce hygienic bee stocks. The process of amalgamating the hygienic trait with the tracheal mite resistance has been continued for 4 generations in Ontario.

3. Augmentation and marketing of mite resistant bee queens in Ontario and other countries. An estimated 15 000 queens were produced from Tracheal Mite Resistant-Hygienic bee stocks in 2000. Most of these queens were used for re-queening bee colonies across Ontario but about 2500 queens were exported to beekeepers in the USA. Queen bees were sold at the Eastern Apiculture Meeting in Salisbury Maryland. An advertising program was also organized with the Ontario Bee Breeders Association.

4. Evaluation of Quality of HoneyBee Queens Produced in Ontario. In 2000 we continued the 1999 evaluation of the quality of honeybee queens in Ontario. Four queen producers sent a total of 23 queens for evaluation. Queens and attendant workers were examined for tracheal mite infestation and nosema infection. Results showed that queens and workers were not infected with mites or nosema. The average number of sperm per queen was 6.54 ± 0.41 million (Mean $\pm$ std error). The numbers of sperm ranged from 3.6-9.6 million/queen. In general the number of sperm was significantly higher in 2000 queens in comparison to 1999 queens. These results showed that the queen producers produced healthy queens and followed recommendations to improve queen quality.

5. Bee Breeding Symposium (M. Nasr and D. McRory). A bee breeding symposium was held in Guelph. Beekeepers interested in bee breeding and queen production attended the symposium. Professor M. Spivak from University of Minnesota was a guest speaker at the symposium. Several topics were covered including bee breeding systems, breeding mite resistant bees, production of quality bee queens, and economics of requeening and management of mites in bee colonies.

B. Importation and Evaluation of the Russian Honey Bee Stock for Varroa Resistance and Economic Traits in Ontario (M. Nasr and G. Wilson)

Eggs from Russian honey bee stocks were imported from Corfu, NY, USA to a certified bee quarantine facility in Smithville, Ontario. 96 queens were produced from the grafted cells. Russian honey bee's semen was imported to the Townsend Bee Facility at the University of Guelph, Guelph, Ontario. The semen was used to inseminate Russian and Ontario bee queens. 17 instrumentally inseminated pure Russian queens, 45 Russian queens open mated with Ontario drones, and 14 Ontario queens inseminated with Russian semen were successfully introduced to bee colonies. 76 bee colonies with Russian genes were wintered. Evaluation of this Russian bee stock will commence in Spring 2001.

C. Development of an Integrated Pest Management (IPM) Program to Control Honey Bee Parasitic Mites (M. Nasr)

1. Re-evaluation of Mite-Away Formic Acid Pad. To improve the efficacy of formic acid Mite-Away pads in controlling varroa mites in bee colonies, pad size, hole size and the volume of formic acid applied per pad were investigated. Results showed that tested pad size, volume of

formic acid and hole size did not significantly affect the evaporation rates of formic acid. We found that during a cold spring making three 5" slits after two weeks in the perforated bags helped to increase the formic acid evaporation rates and achieve high varroa mite kill. The average (mean $\pm$ std error) efficacy of formic acid Mite-Away pads on tracheal mites and varroa mites was $94.9\% \pm 4.8\%$ and $81.3\% \pm 9.2$, respectively. The treated bee colonies in this experiment had 2-3 brood chambers which may affected the formic acid efficacy on varroa mites.

2. Impacts of Tracheal Mites on the Respiration and Thermoregulation of Overwintering Honey Bees in a Temperate Climate (Skinner, Nasr, and Kevan). The oxygen consumption rate after acclimatizing to 15°C was significantly lower for individual tracheal mite infested bees than for non-infested bees. Bees with sealed spiracles had the lowest oxygen consumption rate. Oxygen consumption after acclimatization to 24°C and to 5°C was significantly lower for clusters of 200 mite infested bees than for non-infested bees. Tracheal mite infested colonies had significantly lower core cluster temperatures during winter than non-infested colonies. This research has led to the development of an important recommendation to beekeepers. Additional protection to bee colonies during winter is needed to increase the survivorship of bee colonies. The indoor wintering facility and the Davies system offered more protection than did the waxed cardboard boxes and the tar paper wrap.

3. Evaluation of the Efficacy of Oxalic Acid, Apilife Var, Formic Acid (Mite-Away Pads) And Apistan® on Varroa and Tracheal Mites in Fall. The efficacy of formic acid (Mite-Away pads), Apistan®, Apilife Var, as well as two concentrations (2.8% and 3.5%) of oxalic acid in 50% sugar syrup on varroa and tracheal mites was determined in fall 2000. For oxalic acid, 5 ml oxalic acid solution/bee way were applied by trickling the solution on the bees between the frames. Apilife Var, Apistan, and formic acid Mite-Away pads were applied as recommended. Apistan® proved to be the most effective treatment, on average killing $96.961 \pm 0.89\%$ (mean $\pm$ std error) of varroa mites. This was followed by formic acid Mite-Away pads at $94.75 \pm 1.88\%$, 3.5% Oxalic Acid at $94.42 \pm 1.64\%$ in single brood chamber colonies, and $82.45 \pm 7.14\%$ in double brood chamber colonies. The efficacy of Apilife Var was $67.98 \pm 6.74\%$, and 2.8% Oxalic Acid was $60.35 \pm 6.47\%$. These results suggest that while the varroa treatments currently recommended in Ontario are effective, oxalic acid could become a viable alternative.

4. Improving Honey Bee Hive Product Quality: Preliminary Determination of Miticide Residues in Honey and Beeswax (M. Nasr and K. Wallner (Germany)). Samples of honey and wax from Ontario were analyzed for the residues of 9 miticides including Fluvalinate-tau (Apistan®), Coumaphos, Bromopropylate, Flumethrine, Acarinathrin, Chlorfenvinphos, Tetradifon, Vinclozolin, Phos-ester which have been used around the world to control varroa mites. Honey and the wax produced in Ontario were found to be safe for food consumption. Residues of miticides were not found in most of the samples and when found they were below the allowable limits. One sample of wax from the brood chamber contained Coumaphos residues (0.7 ppm). The source of Coumaphos was plastic foundation coated with wax imported from the USA. Using the miticides as recommended in the Ontario IPM program has helped to keep the residues at very low levels in comparison to European countries.

5. Evaluation of Practices of IPM Program by Ontario Beekeepers (M. Nasr and D.

McRory). A survey of beekeepers in Ontario showed that varroa mites occur throughout most of Ontario. Tracheal mites were reported in 41.93% of the beekeeping operations. Mites are controlled in Ontario using two registered chemicals, Apistan® and formic acid. The average number of years of Apistan® use is 4.3 ± 1.2 years (mean $\pm$ std). Presently Apistan® is used by 96.8% of the beekeepers while formic acid is used by 77.9% of beekeepers in Ontario. 18.3% of the beekeepers use Apistan® in both spring and fall for varroa control. 76.3% of the beekeepers use Apistan® only once in the fall. A rotation of Mite-Away (single application formic acid) and Apistan® is used by 67.7% of the beekeepers.

D. Innovative Quality Assurance: Honey Bee Pollination in Agriculture (M. Nasr)

Effects of Pollination on the Quality of Apples: In 1999-2000 season, 1344 randomly chosen apples from two well-pollinated and two poorly pollinated apple orchards which had Ida Red and Red Delicious apples were evaluated. A significant increase in fruit weight, volume, height, width, breadth and the number of viable seeds was found in apples from well-pollinated orchards. A significant correlation was found between seed number and apple weight. Apples from well-pollinated orchards had a significantly higher percentage of apples with large width than poorly pollinated orchards. For each increase by 1 seed, the weight of each Ida Red apple increased by 4 g and the weight for Red Delicious apple increased by 7 g.

2. Survey of Pollination Practices by Beekeepers and Farmers (M. Nasr and D. McRory).

Many apple and cucumber growers rent colonies for pollination, but most growers rent fewer (25-50%) colonies than the recommended number per acre. A wide range of prices was reported. Most of the pollination contracts were verbal. Colony strength was of concern to most growers, but many of them did not check rented colonies for strength. 45% of growers are willing to hire a beekeeper to check colony strength and health.

3. Pollination Symposium (M. Nasr, D. McRory). A pollination symposium was held in Simcoe with beekeepers and fruit and vegetable growers attending the symposium. A world renowned pollination expert from University of Washington, Professor D. Mayer was a guest speaker at the symposium. Several topics were covered including pollination ecology of crops and honey bees, management of bee colonies for pollination, impacts of pesticides on honey bees, and economics of pollination.

E. Breeding Honey Bees Resistant to Varroa jacobsoni (T. Szabo)

In 2000, using the methods described in the American Bee Journal, 1998, 6:464-466 and 1999, 7:537-540, the varroa populations were monitored in 200 colonies. Bee colonies had an exceptionally low varroa mite population. The bee colonies with the lowest varroa counts and highest scoring hygienic behaviour were used for the rearing the new generation of queens. Research data for 2000 are being collected, analysed and prepared for submission to the Ontario Beekeepers' Association

APPLES

Apple research in Ontario is primarily conducted at Agriculture, Agri-Food Canada (Vineland) and the University of Guelph (Guelph, Simcoe, and Ridgetown). A selection of research accomplishments and on-going research was sub-mitted and is available from the chair on request.

The restructuring of OMAFRA extension on Dec. 2/99 significantly reduced the person-years dedicated to development projects and the delivery, maintenance, and further development of apple extension in Ontario. In spite of this reduction, remaining staff were able to make significant contributions to the Apple Industry through several significant projects, development of resource materials and educational events. Please see Appendix for a list of Extension Accomplishments.

- Regional testing of advanced AAFC, Summerland, BC apple selections planted in 1998 and 1999 was continued this year. In addition to Simcoe and Cedar Springs, the Canada Apple Cultivar Trial was established at Clarksburg. The objective of the trial is to a) evaluate the performance of advanced BC selections in and across Ontario b) measure their suitability for commercial orchards; and c) allow growers the opportunity to evaluate tree habit, vigour and fruit quality (Dr. John Cline, John Zandstra, Ken Wilson).
- Extension staff are continuing to work with the OAMC and OFTA to secure and propagate new cultivars for the on going OAMC Cultivar Demonstration Trials across Ontario. Eight locations were planted in the spring of 2000 and all were visited during the growing season to inspect trees and consult with the co-operators to insure good tree performance (Ken Wilson, Marg Appleby).
- One large chemical thinning trial to study timing of applications was conducted in the London area. The best treatments presently recommended in Pub. 360 were applied at different timings to study the efficacy window for best use (John Gardner).
- Several foil mulch demonstrations were undertaken across the province. The concept of light management with foil mulch is sound but application to the surface under the trees is now being investigated for mechanization options (John Gardner).
- Participation in pollination study in cooperation with the U of G. The purpose is to study pollination outcomes under time limited intervals (John Gardner)
- A Controlled Atmosphere Storage School for Commercial Storage Operators was held in July. This was the first province-wide storage school held in several years and was attended by 55 commercial operators representing all the major facilities in the province (Ken Wilson).
- Developed an IPM protocol for Ontario apples for the World Wildlife Fund and facilitated meetings between the WWF, the OAMC and the Norfolk Fruit Growers Association (NFGA). The OAMC subsequently distributed the protocol to apple growers across the province for comment. Intention is to make the IPM protocol part of the Orchard Crisp label requirements. NFGA and WWF are negotiating a marketing agreement with Sobeys to sell a line of "eco-apples" (Bernt Solymar).

- In partnership with OAMC coordinated the development of an agriphone delivery program using Healthy Futures grant. Recruited 5 consultants/practitioners across province who were contracted by the OAMC to deliver agriphones in the following areas: Norfolk, Georgian Bay, Elgin-Oxford-Lambton, Ottawa Valley, and Northumberland-Durham-Prince Edward. Set up 6 conference calls with tree fruit IPM practitioners across Ontario. These were very successful with 100% participation. Pest and crop updates were provided for each area followed by discussion on various issues. All agriphones were sent to me for review and comments. Emphasis was on educational content of the agriphone messages with frequent reference to pertinent sections of the IPM manual (Bernt Solymar, Marg Appleby).
- Organized and coordinated an apple grower study tour to New Zealand to visit orchards, research stations and marketing cooperatives, and attend the IDFTA conference in Napier. Five growers accompanied me. Slide presentations were given to 3 grower groups (Norfolk, Elgin, Georgian Bay) and a copy of my OPT was written up in the *Orchard Network* newsletter (Bernt Solymar).
- In partnership with Dr. Larry Gut, Michigan State University, a dogwood borer mating disruption trial was initiated in 6 orchards located in: Leamington, Denfield, St. Thomas, Tillsonburg, Simcoe, Georgetown. Completion expected in 2001. To be followed by cooperation with ShinEtsu to acquire Canadian registration for the product (Bernt Solymar).
- In partnership with Dr. Mike Hardman, AAFC, Kentville, NS, releases of *Typhlodromus pyri* predatory mites were conducted in Norfolk county. This is the 4th year of releases with data being collected each growing season on the success of establishment of these biological control agents (Bernt Solymar).
- Several trials were conducted on various pheromones and traps for codling moth, oblique banded leafroller and apple maggot. Results have meant recommendation for Ontario growers to adopt a new and more efficient apple maggot lure (Bernt Solymar).
- Continued High Density systems trial which was established in 1998 in 2 local orchards. For the first time data was collected on growth and yield parameters (Bernt Solymar).

Extension Publications And Other Activities:

- Through a continuing partnership with the Apple Growers of Ontario (formerly known as Ontario Apple Marketing Commission) the OMAFRA Apple Team was able to circulate to commercial apple growers in the "PICK of the News", 35 pages of technical information in the form of the *Orchard Network Newsletter*.
- The following factsheets were updated to the year 2000 and printed:

00-007 Apple Rootstocks
 00-005 Pruning Fruit Trees
 00-003 Harvesting and Handling Apples
 00-027 Evaluating Maturity of Empire, Idared and Spartan Apples
 00-025 Evaluating Maturity of McIntosh and Red Delicious Apples
 00-011 Crabapple Pollenizers for Apples;
 00-013 Producing Quality Empire Apples
 00-073 What You Should Know About Fruit Production in Ontario
 00-029 Susceptibility of Ontario Grown Apples to Scald in C.A.
 00-015 CA Storage Recommendations for Apples Grown In Ontario

00-035 Guide for Spraying Fruit Trees
00-009 Bitter Pit Control in Apples

- All the tech-sheets from Publication 310, *Integrated Pest Management for Ontario Apple Orchards*, have been put on the OMAFRA website.
- *The Apple Industry at a Glance* on the OMAFRA website was updated.
- The Partial List of Fruit Tree Nurseries on the OMAFRA website was updated.
- *Business Considerations for Commercial Apple Growers* on the OMAFRA website was updated.
- Developed and delivered 11 apple IPM workshops in January and March 2000 to familiarize apple producers with the *Integrated Pest Management for Ontario Apple Orchards* manual. Eleven workshops were held as follows (# of participants): Simcoe (15), Bowmanville (16), Brighton (8), Georgetown (15), Leamington (14), Thornbury (21), Thornbury (22), Simcoe (15), New Sarum (14), Brighton – fire blight workshop (10), Simcoe – fire blight workshop (12). OAMC provided funding support from a CanAdapt grant. M. Appleby and A. Verhagen assisted in delivery of workshops, Dr. Gordon Bonn delivered fire blight workshops (Bernt Solymar, Marg appleby, Annette Verhagen, Dr. Gordon Bonn).
- Extension personnel participated in over 98 hours of presentations to grower groups on cultural issues in 2000. This list of speaking engagements includes: The Apple Day at the Ontario Horticultural Crops Conference, various grower apple days across the province, thinning workshops, apple study groups, twilight meetings and tours.

BERRY CROPS

Significant Research Accomplishments

Agriculture and Agri-Food Canada (AAFC)

Greenhouse and Processing Crops Research Centre, Harrow

Canadian Clonal Genebank. *Margie Luffman*

The Canadian Clonal Genebank continues to maintain germplasm of indigenous small fruit and named cultivars in its holdings. These include: strawberry, raspberry, currant, gooseberry, blueberry and elderberry. There are approximately 2000 small fruit accessions. All accessions are maintained in protected culture and several are established in field plantings where evaluations are done. Germplasm is available free of charge to researchers and breeders.

Southern Crop Protection and Food Research Centre (SCPFR), Vineland Station

Response of Strawberry Selections to Root-lesion Nematode. *John Potter and Adam Dale*

Research on nematodes and strawberries involves a test of advanced breeding lines and two standards (Veestar, Annapolis) against the root-lesion nematode *Pratylenchus penetrans*, to determine the resistance/susceptibility and tolerance/intolerance of the lines. The test is being run in nematode-infested greenhouse groundbeds at AAFC SCFRC-Vineland.

University of Guelph

Department of Botany

Development of Additional Testing Procedures. *Annette Nassuth, Sandra Stewart and Jen Myslik*

Preliminary results show that RT-PCR detection of plant viruses is possible if petiole sap is collected on membranes which are pre-treated with RNase inhibitors. Good reliability was obtained for viruses with greenhouse-grown plants. Reliability was not good with samples collected from field-grown plants in the Fall. Better results are expected for samples collected in the Spring. This method, if reliable, would circumvent the precise handling which is normally required to avoid degradation, instead it would be possible to collect samples in the field on membranes and mail the membranes to a laboratory for further testing.

A new "stab" RT-PCR method was also developed. Small, fresh plant tissue samples could be used, after minimal treatment, to test for the presence of virus and plant nucleic acid. Some preliminary results were presented at the CPS Regional Meeting, Guelph, May 2000 and the CBA/CSPP Conference, London, Ontario. June 2000.

Department of Plant Agriculture, Horticultural Science Division, Guelph

PCR Diagnostics for Anthracnose of Strawberry. *Judith Strommer, Melissa Loftus and Wendy McFadden-Smith*

We have identified diagnostic primers for the *Colletotrichum* spp. associated with strawberry anthracnose, and successfully tested them with about fifteen other spp. deemed likely to be present on Ontario strawberries and with multiple isolates of *Colletotrichum*. We have demonstrated our ability to identify anthracnose infections from the field. One paper has been submitted for publication. Melissa is currently testing the field samples collected by Wendy McFadden-Smith this summer, together with samples collected in Manitoba by Dr. Robert Bohrs.

PCR Diagnostics for Red Stele, Crown Rot and Leather Rot of Strawberry. *Judith Strommer, Melissa Loftus and Wendy McFadden-Smith*

Similar work has been carried out for *Phytophthora* fungal infections. Although I have not seen the last of Melissa's data, I believe we have reached a similar stage in the research. I am hopeful that I will be able to prepare a manuscript on this work when I return in December.

Simultaneous Diagnostics for Multiple Diseases of Strawberry. *Judith Strommer, Melissa Loftus and Wendy McFadden-Smith*

This work has been delayed by the many field samples sent by Dr. Bohrs and Dr. McFadden-Smith. We felt the more immediate need was to apply the basic PCR test to field samples, which

constitute the real test of its usefulness. Melissa has carried out some tests, however, and demonstrated the ability to PCR-amplify multiple bands in one sample. So far these tests have been restricted to DNA tests of fungal pathogens.

By January, Melissa is expected to work at the modification of the protocol such that fungal and viral tests can be merged. This will require the testing of RNA instead of DNA. It is expected to be of particular interest in the testing of cuttings for import/export. It will be carried out in collaboration with Dr. Annette Nassuth.

This work was originated with funds from the Ontario Berry Growers and is currently supported with grants of \$5000 from OMAFRA and \$7500 from an OMAFRA Special Projects Fund.

Raspberry Breeding. *J.A. Sullivan*

The raspberry breeding program seeks to produce new cultivars and germplasm with high yields of quality fruit and good winterhardiness levels. Winterhardiness is an important selection criteria as it will contribute to wide adaptability of cultivars and stable yields over time. In the crossing program, germplasm from major raspberry-growing areas have been used as sources of valuable genes in production genetic backgrounds. The 8 selections originating from the first phase of the breeding program were evaluated at Ridgetown, Simcoe and Kentville. The selection 88-117D has excellent potential at these locations demonstrating high levels of winterhardiness, yield and fruit quality.

Micropropagation of Advanced Raspberry Selections. *J.A. Sullivan and W. Shei*

The successful propagation of advanced selections is very important in the breeding cycle. There was great difficulty micropropagating the raspberry selections from our breeding program. Tissue culture systems were developed or refined to allow multiplication of the advanced selections.

Genotype by Environment Interaction in Raspberry *J.A. Sullivan*

Statistical models were used to estimate yield stability, genotypic, environment and interaction contributions in fall-bearing raspberries. One new and more sophisticated analysis permits the identification of optimum environments or regions which are ideally suited for testing of berry crops. This information could be used to refine wide area testing schemes to optimize use of resources.

Genotype by Environment Interaction in Strawberry Selections *J.A. Sullivan*

Advanced selections and strawberry cultivars from the Guelph and St. Jean (AAFC) breeding programs are being tested at both locations. Special emphasis is being placed on yield, fruit quality and disease reactions to identify the factors contributing to the genotype x environment interaction. This type of selection effort will assist in the identification of superior cultivars adapted to a wide geographic area.

Strawberry Genetics and Biotechnology. *J.A. Sullivan*
(NSERC funded)

i) The synthetic octoploid system was refined to facilitate the transfer of genes from lower ploidy species to the cultivated strawberry. An extensive crossing and chromosome doubling program resulted in several hybrids at the diploid and tetraploid levels. These hybrids were then used to create synthetic octoploids (SO). Introgression has begun to hybridize synthetic octoploids and strawberry cultivars to introgress genes from the wild species into the cultivated types. The first generation of SO x cultivar crosses is currently under observation. A few second generation crosses have been completed.

ii) Research continues to develop an *Agrobacterium* mediated transformation system for the Ontario strawberry. Kanamycin and gus-genes have been inserted and are expressing. Confirmation of transformation will be done using southern blots. The system is being used in collaboration with Dr. Paliyath for insertion of genes for fruit quality.

Berry Crops Management. *J.A. Sullivan, J.E. Vanden Heuvel, and S. Couling*

i) An intensive study was completed to compare three trellising systems at four cane densities in summer bearing red raspberry. The three systems compared were hedgerow, V-trellis and single-sided shift trellis. The V-trellis system produced the highest yields at all but the highest cane densities. The single-sided shift trellis could not be adapted to red raspberries due to the presence of vigorous primocane growth which interfered with the dynamic movement of this system. Yields of raspberry trained to the shift trellis were lower than the V-trellis. Picking efficiency of the shift trellis was not greater than the other two systems.

ii) A study was started to improve the yield potential of strawberry by enhancing the microclimate during flower bud initiation period in the fall. Floating row covers are being applied at weekly intervals during the fall starting in September. Measurements taken at Cambridge Research Station indicate that floating row covers create higher temperatures (+3 to 5°C) for a longer duration around the plant. Flower bud initiation should occur at higher rate for a longer duration with the assistance of row covers resulting in higher yield potential. Preliminary results indicate yield increases of 10 to 40% using row covers. Berry number is more sensitive to row cover treatments than berry weight.

Department of Plant Agriculture, Simcoe

Strawberry Breeding. *Adam Dale, Linda Packer and Becky Hughes*

Two selections 53M54 and 32R11 are being propagated for release in the spring of 2002. These selections are late fruiting with good fruit qualities and were selected from a group of 13 selections trialled at 17 University of Guelph and grower sites throughout the province. Two other selections, 32R14 and 67K74, are being propagated for release at a later date.

One selection, 81RT9, was entered in regional/grower trials this year and a further 22 selections are in various stages of micro-propagation and virus-testing for trials from 2001 onwards.

16NL11, selected at New Liskeard in northern Ontario, has gone into trials with northern growers. It has outyielded Cavendish two years out of three, and this year had larger berries.

Raspberry Production in Greenhouses *Adam Dale, Elizabeth Kent and Linda Packer*

In dormancy-breaking tests we have been able to break the dormancy of Nova, Tulameen, Autumn Britten and Polana plants six weeks after they were placed in a growth chamber at 7 °C either in August or September. Field-grown plants of the same four varieties broke dormancy after they had accumulated 840 hrs (5 weeks) with a maximum of 7 °C.

With the fall-bearing raspberries, we have been able to fruit them for three years without subjecting them to a chilling period. They go into dormancy in a heated greenhouse and the root buds eventually start growing. The floricanes do not break dormancy. However, with six weeks at 7 °C in a growth chamber enables us to fruit the Autumn Britten and Polana on both flori- and primo-caness more or less continuously.

Highbush Blueberry Irrigation x Variety Trial *Adam Dale and Linda Packer*

Total yields from first six harvests of the cultivar x irrigation experiment has so far shown no treatment differences. However, interaction between annual yields and irrigation demand treatments has been highly significant. Yields for the daily irrigation treatment were the lowest at the start of the experiment and have been the highest for the last three years, whilst the tensiometer and WISP model treatments started off as the two highest treatments and have been the two lowest treatments for the last three years. The results suggest that the evapotranspiration treatment which uses about 25% of the water used in the daily treatment, would be acceptable as a recommended treatment.

Fragaria virginiana *Adam Dale and Linda Packer*

Reconstituted *Fragaria x ananassa* selections were fruited in rows for the second time this year. Two selections from the cross *F. chiloensis* 'Pigeon Point' x *F. virginiana* 'Montreal River 10' again had large fruit. Another selection 342DL142 produced the equivalent of 11.2 t/ha.

Yield Component Analysis in Raspberry *Adam Dale, Elizabeth Kent and OMAFRA Berry Team*

Again this year 14 raspberry blocks throughout the province were examined for yield component analysis. Total potential yields ranged from 19.9 t/ha to 1.5 t/ha compared to 28.9 t/ha to 5.4 t/ha last year. This lower range could be accounted for by the wet cool weather experienced this year.

Strawberry Bulletin Published *Adam Dale, Gerry Walker, and Pam Fisher*

The Bulletin 'Growing Strawberries in Ontario' OMAFRA Publ. 513 has been extensively revised to include new production methods, varieties, and pests and diseases. This edition was published this year.

Kemptville College

Strawberry Variety Trials. *J. Madill*

Two provincial replicated trials (1998 and 1999) were harvested at Kemptville in 2000 with both yield and berry size recorded. Summarized results were used in the provincial recommendations. Since conditions in the east tend to be different from the southwest, the variety trials had both the provincial selections plus a selection of varieties of interest to growers in Eastern Ontario. In 2000, a space planting of plant breeding material from Simcoe was established with a view to

making selections in 2001 under eastern Ontario conditions. The trial was sent into the winter without a straw cover to provide more severe winter conditions.

New Liskeard Agricultural Research Station (NLARS)

Berry Crop Observation Trials. *B. Hughes and C. Keith*

Four newer cultivars from Nova Scotia planted in observation trials in 1999 were compared to Veestar and Cavendish for yield and quality. Fourteen cultivars and 9 selections were planted in 2000 as part of the Ontario Coordinated Berry Crop Trials.

Breeding Winter-hardy Strawberries. *B. Hughes and A. Dale*

16NL11 was propagated in Simcoe and is currently in trials at 5 grower sites across northern Ontario. Over eight hundred seedlings from New Liskeard and Simcoe parents were planted in 2000 for selection in 2001. Evaluation of the five New Liskeard selections made in 1995 and 10 selections made in 1998 continues in 10-plant plots. Some of the 1998 selections showed great yield potential in 2000. This project is partially supported by the Northern Ontario Heritage Fund Corporation and the OBGA.

Strawberry Micropropagation for the Breeding Program. *B. Hughes and W. Cook*

The SPUD Lab maintained 36 strawberry selections for the Department of Plant Agriculture in Simcoe. Six new selections were put into culture in 2000 and 9 selections were shipped to Simcoe for establishment for virus testing.

Cedar Springs Research Station, Ridgetown College

Weed Control in Strawberry. *F. Tardif and J. Zandstra*

Trials to identify and evaluate herbicides for minor use registration on strawberries continues at Cedar Springs. Dual, Frontier, Prowl, Blazer, Reflex, Goal, and Select are presently being evaluated on the variety Kent. Yield data was collected on trials planted in 1999, and another trial was established in 2000.

Strawberry Variety Trials. *J. Zandstra and A. Dale*

An observation variety trial which was established in 1997 was harvested again in 2000. This trial contains 20 numbered selections from the Ontario strawberry breeding program, with Veestar, Governor Simcoe and Kent as standards. 53M54 and 21K74 performed well and demonstrated potential for this region. Another coordinated observation trial was established in 2000, containing Lacadia, Yamaska, Winona, Brunswick, Seneca, Sable, Mesabi, Evangeline, Latestar, Mira, 6 numbered selections from Quebec, and Kent, Veestar, and Governor Simcoe as standards.

Raspberry Variety Trials. *J. Zandstra and A. Sullivan*

Summer bearing observation trials which were established in 1997 were fruited for the second year in 2000. This trial contains numbered selection from New Jersey (2), New York (1), Guelph (8), as well as Tulameen, Qualicum, Malahat, Nova, Glen Magna, Glen Ample, and Lauren. Gel-20 (New Jersey) and Encore were the most productive. Winter injury was noted

on all selections, with some approaching 30% of the cane damaged. 88-112A, 88-18B, Lauren, and Encore were ranked highest in fruit quality.

A fall-bearing observation trial which was established in 1998 and 1999 was fruited for the first time in 2000. This trial contains Autumn Britten, Autumn Bliss, Polana, Anne, Carolyn, Heritage, Goldie, Kiwi Gold, JEF-F1, MBT-F1, and NO-1, and Prelude. Polana and Autumn Bliss were the top yielding cultivars. Autumn Britten had the largest fruit size, but yields were low due to low cane numbers.

A replicated summer bearing variety trial containing new Guelph selections was established in 2000. Numbered selections include 88-18B, 88-020, 88-17D, 88-46A, 88-134, 88-107, with Boyne and Nova as standards.

Evaluation of Cover Crops and Reduced Tillage Systems for Weed Suppression in Strawberries. *J. Zandstra, F. Tardif, J. O'Sullivan, L. Huffman, P. Fisher, and A. Verhallen.* This project is a first step towards developing an integrated approach to weed management in strawberries. A rye cover crop was established in the fall of 2000, and in the spring of 2001 strawberries will be planted into rye residue under no-till and various reduced tillage systems. Plant development will be monitored through 2001, and yields taken in 2002.

Service Accomplishments

Agriculture and Rural Division, OMAFRA

Publications:

The publication, *Growing Strawberries in Ontario*, Publication #513 (*A. Dale, P. Fisher, G. Walker*), was revised, renamed and printed in English and French with a 5-year shelf life.

Fruit Production Recommendations, Publication #360 (*P. Goodwin, P. Fisher*) and the *Guide to Weed Control*, Publication #75 (*L. Huffman*) were revised for 2000-2001. "*Keeping Berries Safe*" (*B. Schumacher, P. Fisher*), a brochure first developed one year ago, was updated, posted on the website and sent to all OBGA members.

New postings on the **Internet** include a series on the Ontario Weed Gallery; Precautions with Pesticides; Notes on Herbicides and Adjuvants; Sprayer Application Technology; Basics of Weed Management; an ongoing index of weed articles from the various OMAFRA newsletters; and the Berry IPM Scouting Forms.

Demonstration Projects and Field Trials:

Coordinated Berry Trials. *C. Carey, E. Groenewegen and P. Fisher*

Strawberry variety trials were established in 2000 at 19 grower sites and 5 research locations in cooperation with ACHENE and the Coordinated Trials Committee. 80% of grower sites were visited and notes taken on establishment and leaf diseases.

Berry Team Variety Trials. *C. Carey, E. Groenewegen and P. Fisher*

Data was collected from 5 sites, 4 locations and 2 systems (plasticulture and matted row). Data from 3 matted row plantings will be statistically analyzed in November and 1999 results reported to growers.

Cover Crop Demonstrations. *M. Celetti, L. Huffman, A. Verhalen, P. Fisher*

This was the second year of 2-year project to demonstrate the establishment and management of nematode suppressing varieties of marigolds, pearl millet and sorghum-sudan. Trials were located at three sites, and focussed on obtaining good stand with field equipment and weed control with newly registered and potential herbicide candidates. Seeding into a stale seedbed, or at least packing the soil before planting, is necessary to promote a thick stand of these small-seeded crops. In plots where weeds are not suppressed, nematode numbers increase in spite of the suppressant effects of these cover crops.

Monitoring Thrips. *C. Carey and E. Groenewegen*

Populations of flower thrips on strawberries were monitored using several methods and compared to crop damage. Unfortunately, crop damage was not significant and there was no correlation between numbers and damage. Sampling thrips by tapping into a dish was less accurate than using a sharp eye or handlens to count thrips in and on strawberry bloom.

Clipper Weevil Threshold. *C. Carey and E. Groenewegen*

Populations of strawberry clipper weevil were monitored using old and newly proposed techniques. Rating blossom clusters and using the threshold of three highly damaged clusters per meter appears to be appropriate for Ontario.

Raspberry Yield Analysis. *E. Kent, M. Appleby, P. Fisher, A. Dale*

In the 2nd year of a 2-year project, data was collected from 14 fruiting summer red raspberry plantings across Ontario to document yield potential. Yields were down substantially (25-60%) in SW Ontario compared to last year but were generally equal to or above last year's calculated yield on farms in Eastern Ontario. The data will be used to make recommendations about plant density in red raspberries, and to update the cost of production figures.

Weed Management in Berry Crops. *P. Fisher and L. Huffman*

An IWM thinktank/conference call for strawberries was hosted in Guelph on April 19th. Representatives from Ontario, New York, Ohio and Quebec participated, with interest from New Brunswick, British Columbia and Michigan. A follow-up meeting was held in Ohio in October. The Berry Team is cooperating with John Zandstra *et al.* on a new research project, Evaluation of Cover Crops and Reduced Tillage Systems for Weed Suppression in Strawberries.

Progress in Herbicide Minor Use. *P. Fisher and Leslie Huffman*

Data packages were prepared and submitted on Goal, Prowl, Reflex, Dual Magnum and Frontier on new strawberries to PMRA. The data package on Blazer was prepared for BASF in February, and a letter of support was secured for URMULE and submitted to PMRA. Cooperators were set up to further test Blazer on problem weeds. Test sites in Canada were coordinated to test a biological herbicide on round-leaf mallow (Mallet - formerly Biomal).

Newsletters and Crop Updates: P. Fisher

The *All Ontario Berry Grower* is an amalgamation of two OMAFRA newsletters for berry growers which is published monthly in the Grower and circulated to all strawberry growers through the OFVGA. It is also available on-line with over 150 electronic subscribers.

Berry Bulletin: A weekly update for consultants, scouts, and growers, this bulletin replaces several regional berry agriphones. The message was developed using feedback from OBGA directors, scouts and consultants across the province during the growing season. The bulletin provided answers to frequently asked questions, and emphasized pest management and best management practices. It was emailed or faxed to 34 growers and consultants and 15 OMAFRA /University staff. It is also recorded on a toll-free answering service and posted on our website. The *Ontario Hort Report*, biweekly report, is available on the internet.

Meetings and Programs Arranged:

OHCC Berry Day: The program, "*Best Beginnings for Berries*" was designed to combine practical experience with research results. Speakers emphasized management techniques for improving establishment of strawberry and raspberry crops. 80-110 growers attended throughout the day (*Berry Team*).

OHCC Food Safety Workshop was fairly well attended (15-20 each session) and a good start to an important topic (*Food Safety Team*).

Eastern Ontario Berry Day April 6, 2000, Kemptville (*K. Schooley*)

Brighton Region Berry Day April 4, 2000, Brighton (*M. Appleby*)

Strawberry IPM Training Sessions for students and growers in May in Woodstock and in Brighton, this two-part meeting was moderately attended (20 in Woodstock, 10 in Brighton). It laid the groundwork for informal training during the growing season and included a first draft of weed scouting techniques for berries. (*Celetti, Appleby, Fisher*).

Presentations and Articles Prepared for Growers:

P. Fisher

Northeast Berry Conference: Sturbridge, Mass. Dec 14-15/99

New Perspectives in Insect IPM

- *Food Safety for PYO*

MSU strawberry school, Battlecreek, Michigan: Jan 11-12

- *Weed control for strawberries (1 hour)*
- *Monitoring and Control of Strawberry Insects*

Ontario Berry Growers Association, Ingersoll Jan 14-15

- *Plasticulture for Strawberries Round Table discussions on berry pests*
- *Managing Weeds in Berries With and Without Chemicals*

Ontario Hort Crops Conference, Feb 16-17

- *Watch out: expensive pests in new plantings*
- *Food safety for horticultural crop producers: hygiene*
- *Managing Weeds in Berries before and after Planting*

L. Huffman

Weed Management Strategy for Cover Crop Trials

New Herbicide Registrations for Cover Crops

Time to Control Perennial Weeds

Weed Tips for Late Summer

Labour Day: Critical Time to Control Problem Weed in Strawberries

New Directions in Strawberry Weed Management

Using Casoron Herbicide for Berries

OBGA, University of Guelph & AAFC

Berry Crop Plant Propagation Program. *OBGA ACHENE Committee, Adam Dale, Becky Hughes and Margie Luffman*

The OBGA continues to manage and fund the Plant Propagation Program. Adam Dale provides expert support to the Ontario plant propagation program and the ACHENE Committee. Becky Hughes and Margie Luffman contribute technical expertise and Nuclear disease-tested plant material for the program. Virus testing and propagation of strawberry and raspberry cultivars is conducted at the Genebank. The SPUD Unit produced over 1,400 *in vitro* strawberry plantlets of 12 cultivars for the screenhouse in 2000. The SPUD Lab currently maintains 21 strawberry cultivars for the Plant Propagation Program. The number of cultivars *in vitro* requested for 2001 has increased 75%.

CRUCIFER CROPS

Research/Service Accomplishments

1. Completion and distribution of the 'Cole Crop IPM Video'.
2. Discovery and identification of the 'swede midge', a new pest in Ontario.

GINSENG

Research And Service Accomplishments 2000

Southern Crop Protection & Food Research Centre,
Agriculture and Agri-Food Canada

Brown, D.C.W., Amyot, L. and T. Rintoul. 2000. Micropropagation of North American Ginseng. International Ginseng Conference. November 27-29, Vancouver, B.C.

Micropropagated transplants could be an effective approach to boost the expansion, efficiency and profitability of the ginseng industry. A micropropagation system for *Panax quinquefolium*, based on a 9-stage protocol involving somatic embryogenesis and multiple shoot formation, has been developed. Somatic embryos can be induced from seed-derived tissue of mid-mature zygotic embryos cultured on growth regulator-free, high sucrose, Murashige and Skoog medium. After seven weeks in culture, somatic embryos form on up to 90% of the explants at up to 20 embryo propagules per explant. Germination of somatic embryos and subsequent shoot development and elongation occurs after an additional four to eight weeks on MS medium supplemented with the plant growth regulator gibberellic acid. Somatic embryo induction and

shoot regeneration from cotyledon explants appears to be genotype dependent, although the response of individual explants (cotyledons, petioles, leaves and roots) is variable among plants but similar from each genotype. Rooted plantlets can be obtained within 120 days from the start of culture. A similar protocol can be used to produce propagules from petiole sections of established plants. Plants can be induced to form a dormant bud that, after a simulated overwintering period of 90-120 days, form normal-looking ginseng plants. Tissue culture-derived plants were planted in prepared beds along with seed-derived control plants in spring and fall plantings and survival was assessed. An added advantage of the overwintering treatment of tissue culture-derived plants is their ability to undergo reduced flowering; an advantage for accelerating a germplasm multiplication or breeding program. The efficiency of the first five of eight stages of the protocol is high (90-95%) and is an effective method for genotype multiplication. The efficiency of the latter stages of the protocol involving shoot development, rooting and acclimatisation to green house/field conditions ranges from 25-65% and requires improvement. Although root production is at the 50% stage, there is a need to improve root quality as the field establishment efficiency of 11% and overwintering efficiency at 3% suggests that root quality of micropropagated plants is a limiting factor for commercial application at the present time.

Capell, B.; Reeleder, R. D.; Grohs, R., and Zilkey, B. 1999. Evaluation of herbicides for management of weeds in cultivation of *Panax quinquefolius*. *Journal of Ginseng Research*. 1999; 23(3):135-147.

Nine herbicide products (fluazifop-p-butyl, clethodim, MCPA-sodium, 2,4-D amine, chlorthal dimethyl, diquat, glyphosate, ethalfluralin and oryzalin) were evaluated for use on ginseng (*Panax quinquefolius*). Products varied in their ability to suppress weeds and certain materials were phytotoxic to ginseng in some trials. Chlorthal dimethyl (broadleaf weeds), MCPA-sodium (broadleaf weeds), fluazifop-p-butyl (grass weeds), and clethodim (grass weeds) were found to be effective as weed control agents and did not adversely affect ginseng growth. Other products tested were either not efficacious or were phytotoxic to ginseng in some trials. Weed populations were mainly introduced into the planting sites via the straw mulches used in ginseng cultivation.

McMullen, C.; Yee, D.; Reeleder, R. D.; Seifert, K., and Dobinson, K. F. 1999. Molecular diagnostics and genetic diversity of *Cylindrocarpon destructans*. [Proceedings of the American and Canadian Phytopathological Societies Joint Meeting, 1999 Montreal]

Amplified fragment length polymorphisms, B-tubulin sequences and pathogenicity tests were used to characterize isolates of *Cylindrocarpon destructans*. Results of studies suggested that North American and Korean isolates are clonally related and that this host-adapted group is highly aggressive to ginseng. Primers designed to amplify ginseng isolates of *C. destructans* were identified.

Quayyum, H. A., M. Gijzen and J. A. Traquair. 2000. Protein toxin and pathogenesis of American ginseng by *Alternaria panax* (Abstract). [Joint Meeting of the Canadian Botanical Association and the Canadian Society of Plant Physiologists, June 2000, London ON] Abstract: *Alternaria panax* Whetzel causes leaf and stem blight of American ginseng (*Panax quinquefolius* L.). The conidial germination fluid collected from droplets incubated for 48 h on detached ginseng leaves was shown to be toxic in detached leaf and whole plant bioassays. It induced water-soaked, brown lesions on ginseng leaves characteristic of foliar symptoms induced by this fungal pathogen in ginseng gardens. The conidial germination fluid did not

produce visible symptoms on leaves of *Hedera helix* L., *Aralia* sp., *Schefflera* sp., *Fatsia* sp., and *Dizygotheca* sp., (also genera in the family Araliaceae). The toxic activity of the germination fluid was destroyed by heat and treatment with proteinase A. The toxic activity of the fluid was retained by an ultrafiltration membrane of 30 kDa molecular weight cut-off. Partial purification of the toxic protein(s) was performed by fast performance liquid chromatography (FPLC) using a Superdex 75 gel permeation/filtration column. Bioactive fractions were eluted as a single peak. By comparison with protein standards the size of the protein was estimated as 35 kDa.

Reeleder, R., R. Roy, B. Capell 1999. Seed and root rots of ginseng (*Panax quinquefolius*) caused by *Cylindrocarpon destructans* and *Fusarium* spp.. Southern Crop Protection and Food Research Centre, Agriculture and Agri-Food Canada, London, ON, Canada. [Proceedings of the American and Canadian Phytopathological Societies Joint Meeting, 1999 Montreal]

Over the past two decades, ginseng has become one of the most valuable herb crops grown in North America. Traditional cropping environments are favourable to disease and significant losses due to root disease are common, despite frequent use of fungicides. Seedlots are often contaminated with pathogens, however, little is known about the causes of seed decay and the role of seed pathogens as incitants of root rots. Data presented show that both *Fusarium* spp and *Cylindrocarpon destructans* are able to rot seeds but that *C. destructans* is a more virulent root pathogen. A modified rose bengal agar (MRBA) medium containing: 1 g KH_2PO_4 ; 0.5 g $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$; 50 mg rose bengal; 10 g dextrose; 5 g Bacto peptone; 15 g Bacto agar; 30 mg streptomycin sulfate; 250 mg ampicillin; 10 mg rifampicin; 665 mg Terraclor 75 WP; 665 mg Botran 75 WP; and 1 L distilled water was superior to PDA in detecting *C. destructans* in diseased roots. Data to support the role of *C. destructans* as a cause of ginseng replant failure are also presented.

Research and Service Accomplishments 2000

University of Guelph

Titles of Papers Submitted for Publication

Proctor, J.T.A. (2000). Ginseng crop establishment: from flower to seed, to plant stand. Proceedings of the International Ginseng Workshop. Z.K. Punja (ed.), pp. xx-yy.

Fiebig, A., J.T.A. Proctor, U. Posluszny and D.P. Murr. (2000). The North American ginseng inflorescence: development, floret abscission zone and the effect of ethylene. Canadian Journal of Botany.

Proctor, J.T.A. (2000). Ginseng production issues for the 21st century. Proceedings of the International Ginseng Conference. American Ginseng Production in the 21st century. Cornell Press, Cairo. New York, pp. xxx-yyy.

Proctor, J.T.A. (2000). Current research on american ginseng production in Canada. Proceedings of the International Ginseng Conference: American Ginseng production in the 21st century. Cornell Press, Cairo, New York, pp. xxx-yyy.

Proctor, J.T.A. (2000). The effects of flower removal on growth of American ginseng roots. Proceedings of the International Ginseng Conference: American Ginseng Production in the 21st Century. Cornell Press, Cairo, New York, pp. xxx-yyy.

Research and Services Accomplishments 2000

Janice Schooley

OMAFRA Ginseng and medicinal herb Specialist

1. Grower Information Day:

Presentations on: E-commerce, NISA, Marketing in Hong Kong and China, Permit to take water, Mint as a trap crop, Rye allelopathy in ginseng, Micronutrients in ginseng, Research Developments in Korea

2. Infoshets published on the Internet in 2000:

- Cutworms in Ginseng
- Missing Plants in Ginseng Gardens
- Slugs in Ginseng Gardens
- Ginseng Seed Diseases
- Introduction of Rhizoctonia into Ginseng Gardens
- Deflowering Ginseng for Increased Yields
- More Spring Diseases of Ginseng
- A Guide to On-Farm Research
- Alternaria Infections in Ginseng
- A Comparison of Sprayer Technology in Ginseng
- Foliar Phytophthora Blight in Ginseng
- Managing Excess Water in Ginseng Gardens
- Mechanical and Chemical Injury to Ginseng
- Temperature-Related Alternaria Symptoms
- Handling Ginseng Seeds
- Symptoms of Phytophthora Root Rot in Ginseng
- Rusty Root Symptoms in Ginseng
- Ginseng Sprayers – Set-ups for Conventional Hydraulic Boom Sprayers with Drop Arms
- Botrytis Infections in Ginseng
- Rye as a Mulch in Ginseng Gardens
- Symptoms of Powdery Mildew in Ginseng
- Insects that Affect Ginseng

3. Articles for Tobacco Grower Magazine:

- The Challenge of Quality Assurance
- Lingering Effects of a Bad year
- Mystery of Rusty Root
- New Ginseng Index Page
- Controlling Disease in Ginseng
- Nutrient Management in Ginseng
- Rusty Root Update

4. Weekly Ginseng Agriphone from April to October published on the OMAFRA Internet site and sent by email and fax to subscribed growers.
5. Prepared new ginseng index page for the OMAFRA Internet site.
6. Facilitated discussions between BC growers, Ontario growers, PMRA, CFIA on the use of Quintozene in ginseng.
7. Presentations on Rusty Root to GGAC Annual Meeting, TAGG (BC) annual meeting
8. Participated in BC international workshop on Rusty Root
9. Presented workshops on disease management, insect management at New York International Ginseng Conference.
10. Expanded Publication 610 to include sections on production practices, seed harvest and handling, root harvest and handling, post harvest handling of roots, abiotic disorders of ginseng, post harvest diseases of ginseng roots
11. Prepared and submitted Emergency Use Proposal to PMRA and obtained Emergency Use for Quadris on Ginseng in Ontario. Supplied BC with data and information to make application for emergency use in BC.
12. Attended International Ginseng Research Workshop in Vancouver

GREENHOUSE AND PROTECTED CROPS

Greenhouse Vegetables

1. Commercial plant clearing system. The Ontario greenhouse vegetable industry is now using commercial companies to assist in cleaning out the greenhouses. Equipment is specifically designed to pull the vines, roll them into compact rolls and transport them to composting or disposal site.
2. Commercial plant propagators. There are now 6 operations that will raise plants for the greenhouse vegetable industry. This allows some growers to specialize in raising transplants and the rest of the greenhouse vegetable operations to be in production for close to 12 months.
3. Light Traps. These are used to monitor and reduce populations of moth pests.

Mushrooms

We investigated the ability, timing and expression of other Trichoderma species to spot mushroom tissue.

A graduate student successfully defended her thesis on post-crop temperatures and post-harvest management procedures necessary to eradicate a Trichoderma green mould infection.

Citation 75WP was submitted for label expansion for application to casing in April 2000. Having been reviewed by PMRA, residue trials have been requested and discussion with the relevant parties are in progress.

A graduate student, investigating a unique spotting problem caused by *Pseudomonas tolaassii*, will defend her thesis in January 2001.

Another graduate student has completed research on the cause(s) for the aggressive nature of *Trichoderma harzianum* (biotype Th4) against *Agaricus bisporus* mycelium and the thesis is in review by the committee.

A graduate student continues his studies on the effectiveness of ozone to enhance post-harvest mushroom quality.

A research project has commenced by a grad student to investigate the fate of pesticides in recycled water used for mushroom compost preparation.

Funding has been secured to investigate the possible role of ammonia suppressants on commercial mushroom production.

The identification of disease samples continues to provide a significant asset to the industry as they battle the background levels of diseases, especially *Trichoderma* spp.

Growers are using Citation 75WP for control of sciarid flies in the compost.

Nematodes for fly control are being used on about 10% of the mushroom production surface area in Ontario and eastward.

GREENHOUSE FLORICULTURE

During the past three years Flowers Canada Ontario has been able to co-operatively fund 8 research projects through AAFC MII funds, CanAdapt and other agencies. These projects located at the University of Guelph and Southern Crops Research Centre, Vineland have addressed issues identified as research issues/priorities by this subcommittee related to crop production, new crop evaluation and development, crop protection and post harvest handling and shelf-life. The industry is extremely pleased with the results achieved by the research teams during this time. Because the industry feels it is very important to maintain a critical mass of scientists to continue addressing these key issues. As a result the industry is hoping to continue to fund similar projects through successfully accessing matching research funds from the same sources as previously. Information and knowledge is being successfully transferred through Annual Research Meetings organised by Flowers Canada Ontario, articles in trade magazines, and several of the key researchers speaking at the Canadian Greenhouse Conference.

For many years the industry has been frustrated by the lack of pesticide and growth retardant registrations, through the URMULE and URMUR programmes that growers have considered necessary to produce quality crops and to remain competitive with their American and European counterparts. Many of the newer products are more IPM friendly, more effective, less toxic and less harmful to the environment. As a result, Flowers Canada National and industry secured matching MII funding for a three-year technical position to work under the supervision of AAFC Scientist and OMAFRA Floriculture Specialist and Greenhouse Floriculture Specialists to focus on label expansions and applied research. As a result, 8 pesticides have received label

expansions that the industry has identified over the past several years. The industry feels that the position was helpful in achieving the first floriculture URMUR registration to date.

The industry is very pleased with the success of industry funded project focussed on the control of fungus gnats and Shore flies. During the past 3 years Rove Beetles (*Atheta coriaria*) were identified as excellent predators of both pests and a protocol has been developed to raise the predator in laboratory conditions. As a result, two biocontrol companies are seriously interested in commercialising the predator.

LOW ACREAGE & SPECIAL CROPS

Significant Research and Service Accomplishments

Sweet Potatoes: Variety trials continue under the direction of Dr. Allan McKeown, University of Guelph, Simcoe. On farm production has increased to an estimated 100 acres. Growers are experimenting with virus tested, 2nd generation plant material from North Carolina. Tissue culture plant production is being investigated. An Ontario farm equipment manufacturer is fabricating and marketing harvesting equipment. State of the art curing and storage, facilities constructed on one farm (Pieters) is providing consumers with quality

Garlic: An estimated 3,500 acres of Garlic was harvested in Ontario. The grower community continues to evaluate new hardneck and softneck varieties. In order to compete with low cost imported product, growers are introducing high density planting and harvesting equipment and continue to pursue an extended tariff on low-cost imported product. (Columbus) John Zandstra, University of Guelph, Ridgeway reported on a study whereby removal of 10% of garlic leaf area reduced bulb size and yield significantly.

Chicory Root: The Lambton Kent Chicory Growers (12) contract grew 135 acres of root chicory to QualiTech Foods Inc. Chicory root yield ranged 9-19 ton/acre (\$80/ton). Agronomic practices require fine tuning. Ridgeway College Staff, University of Guelph, are pursuing weed control studies. Immediate pesticide registration is of vital importance and minor use applications are being evaluated by P.M.R.A. "Inulin", extracted from the chicory root, a novel carbohydrate can be used to replace starches and fats in food processing, also as an ingredient in livestock and pet feeds.

Pickling Cucumbers: In an advanced multipick trial conducted at the University of Guelph, Simcoe (Dr. John O'Sullivan) three cultivars of pickling cucumbers provided a yield in the order of 14 ton/acre, a 15 per cent yield increase over other tested cultivars.

Forage Sorghum/Forage Millet: Minor use registration of a) peak/banvel; b) pardner and c) basagran was acquired (Dr. John O'Sullivan). In demonstration plots, pearl millet and marigolds were evaluated as a nematode suppressing rotational crop in vegetable and berry production.

Pearl Millet: Showing a positive effect and attracting grower interest as fumigants are being questioned. (Mike Cheletti). In co-operation with AERC and AAFC, Delhi, Mike Columbus organized an information day. Pearl Millet acreage planted is estimated to be in the order of 2500.

MUCK CROPS

Significant Research & Services Accomplishments

1. "Leafminers attacking field vegetables and greenhouse crops", J. Chaput, OMAFRA Fact sheet, Agdex 290/620, March 2000.
2. Survey of grower-perceived research priorities at Ontario Muck Crops Conference, Bradford, March 2000.
3. Identification of pea leafminer, *Liriomyza huidobrensis*, as the leafminer causing serious damage on celery in 1999.

NURSERY/LANDSCAPE & TURFGRASS

Significant Research/Service Accomplishments

Research and service efforts continued in 2000, and the following accomplishments are highlighted.

The Collection of Marketing and Business Statistics Relating to the Value-added Aspects of the Nursery, Landscape and Turf Sector of the Horticulture Industry (K. Nentwig, Ridgeway College, U. of G.)

The undertaking to collect statistical information on the business operations of the horticulture sector in Ontario has not been very successful. Two attempts at a general survey of businesses via the Ontario Horticultural Trades Association, with some 12,000 self-administered questionnaires sent out, has so far resulted in too few responses to show sufficient relevant information. An on-going effort to collect these statistics, using other means, will be carried into the next few years, however, in the mean time some comparisons based on U.S. figures and population statistics have been derived. Estimates of approximately \$1.9 Billion for landscape services (the 'green industry'), plus another \$1.3 Billion for retail lawn and garden sales, total \$3.2 Billion in landscape and gardening business in Ontario. Additional expenditures through tax dollars in municipal parks, street plantings and gardens; provincial and federal parks system horticultural efforts; the golf course industry; and the florist trade, will add substantially to this figure.

Farm-gate statistics collected annually in Ontario show a very favourable increase in business activity, where values have increased 43% since 1996, with the horticulture sector becoming the top agricultural crop in 1999 at \$753 Million. The trends to increased overall business activity

can be seen in these figures, and retail sales and value-added components echo this development with an 18% increase in retail sales alone between 1997 and 1998 in the U.S.

The difficulties in accumulating statistical business information from operators in Ontario is not unexpected. Small businesses, perhaps as many as 12,000, with the vast majority of them under ten employees and many of them sole proprietorships and family operations, may not have the information required for this study readily available, or it may be considered too personal to ask for. Timing of the surveys likely played a part in the poor response as well, with a late winter and then early summer duplicate mailing. The early spring and excellent growing season have not allowed for the necessary time and attention to be paid to such a detailed request as a questionnaire on the previous year's business operations.

Socio-economic Capacity Building for Horticultural Civic Beautification: a Model for Small Ontario Communities

Within the recently amalgamated Municipality of Chatham-Kent, some twenty-three communities are struggling with past differences and present commonalities. For at least eight of these communities outside of Chatham, each with a substantial 'downtown' core area, the issue of the activities of horticultural beautification has risen. Former arrangements with local administrations covered flower displays, trees and planters, however, during amalgamation the majority of these localities lost funding, access to labour and equipment, and a means to enhance the public areas. At the same time, increased volunteer efforts by local service clubs and organizations took over many of the fund raising and maintenance responsibilities of the horticultural work, in some cases overloading their time and energy commitments.

A pilot project in Ridgetown in 1999 coordinated these local groups, succeeded in procuring funding assistance, and managed a major portion of the horticultural displays in the downtown area. Repeated in 2000, this project was slightly expanded and included work formerly undertaken by the Horticultural Society, the Chamber of Commerce, the Heritage Preservation Committee, and various other groups. Some of the beautification project work is on public land, specifically planters and hanging baskets in the downtown core, while some is on private land accessible and open to the public, such as the Kiwanis Park. Supporting funds from the participating organizations, and from a door-to-door solicitation from business operators, have helped to sustain the program.

Interns of the JJ Neilson Arboretum (Ridgetown College, University of Guelph), graduates of the two-year Associate Diploma in Horticulture, were employed throughout the season both years. As a model, the program has proven enormously successful, with a commitment underway from a number of groups in Ridgetown to further enhance the beautification project next year. Several other communities have indicated an interest as well, creating the possibility of four Internship positions in 2001. Funding from donations by local organizations and partners, and through the Municipality in the form of area-rated local improvement budget allocations, will be applied for in late November. Discussions with senior Municipal department personnel, with local organizations, and with Municipal Council representatives have been extremely positive. The program leadership, originally instigated by the JJ Neilson Arboretum, is being taken on in one

area by the Horticultural Society, in two areas by the BIA and/or Chamber of Commerce, and in a fourth area by a consortium of interested individuals who serve on various organizations.

The enthusiasm for horticulture, and the cooperation of various groups formerly working on individual projects, has been overwhelming. The program is expected to become a fixture in the Municipality, creating a long-term partnership between residents and local interest groups, the Municipality and its various departments, and the JJ Neilson Arboretum Internship Program. As a model for small communities across Ontario, it is becoming evident that the collaborative format incorporating existing volunteer horticultural endeavours that this program utilizes, works very well to solve many common problems not unique to Chatham-Kent.

Nutrient Management and Fertilizer Studies of Nursery Stock

A major, cooperative study conducted by Dr. Calvin Chong (HRIO/UofG) and Dr. Glen Lumis (UofG) is examining nutrient recycling via recirculation of water and liquid fertilizers in the production of nursery stock. Commercialization of the process is being pursued, based on the success of the early phases of this study. Industry support and cooperation is a significant component of this work.

Dr. Chong and Dr. Lumis are supervising a graduate student studying the horticultural uses of the residue if the anaerobic digestion waste management system prototype currently under development in the City of Guelph.

Other projects by Dr. Chong and Dr. Lumis are investigating different types of fertilizers and systems of delivery, particularly slow and controlled release products. Production recommendations continue to be made based on medium nutrient loss and plant responses for various nursery crop.

Dr. Chong continued to investigate waste materials (such as jack pine bark compost) that may be used in the container or field production of woody nursery stock. Positive results indicate that there is greater potential for the use of composts and organic wastes in the production of nursery stock. Another ongoing project is examining the use of weed guard systems in container production for nursery crops.

Extension Services for Turf and Woody Plants (OMAFRA)

Pam Charbonneau (turf) and Jennifer Hobson (woody plants) have prepared and conducted numerous sessions for various industry groups throughout 2000. They have participated in and helped coordinate annual industry meetings and conferences. The topics presented have ranged from IPM programs to a microscopic-disease diagnosis course for turf. Seasonal hotlines and advisory bulletins continue to function effectively and the fee-for-service AgriFAX program for this information continues to be popular. Regular articles have been written for industry and extension publications; and several publications have been revised and priced as part of the technology transfer process. A survey study of European crane fly in Ontario is ongoing. The OMAFRA website information for turf and nursery production has been significantly revamped and extended, bringing together many new resources.

Turfgrass

The turfgrass research program at the Guelph Turfgrass Institute covered a wide range of areas, including performance evaluations of fertilizers for sports turf and golf course uses, performance evaluation of humic acids on turf, evaluation of vesicular/arbuscular mycorrhizae on turfgrass seedlings, evaluation of erosion control products in turf seeding, the use of compost as an organic amendment for sand rootzone construction and topdressing, evaluation of divot repair mixtures, and three large cultivar evaluation trials (NTEP 1999 perennial ryegrass trial, NTEP 2000 Kentucky bluegrass trial, GTI 2000 creeping bentgrass trial). Some of this work was supported by charging entry fees and on a contract-basis.

There is an ongoing program of evaluation of control methods for turfgrass diseases (Dr. T. Hsiang and Dr. G. Boland of U. of G.), including new biocontrol material for snow moulds. Turf diseases being researched in 2000 included necrotic ring spot, fairy ring, anthracnose basal rot, red thread, dollar spot, and snow moulds. Control methods for broadleaf and grass weeds were also evaluated (Dr. C. Hall, U. of G., including some low risk alternative methods (corn gluten meal).

Dr. M. Sears (U. of G.) had trials at GTI on grub control in turfgrass in 2000. Mr. Ian Scott from the University of Ottawa also ran some grub control trials at GTI examining the use of botanical compounds as alternatives to pesticides.

Genetic improvement of turfgrass species using molecular biological and genetic transformation is an ongoing project in the lab of Dr. S. Bowley.

Environmental aspects of turfgrass management were studied through research programs examining the fate of applied nitrogen to turf systems through gaseous losses, plant use, and leaching (Dr. G. Parkin, U. of G.). Other research in connection with the new putting green installation at the GTI is examining the measurement of soil moisture and irrigation scheduling for optimal water use and conservation. New research (Dr. R. Rudra and Dr. B. Gharabaghi) at the GTI in 2000 included examination of erosion and runoff from irrigated soil, as well as the effectiveness of turf filter strips in control of runoff. Turfgrass cultivar and variety evaluation trials continue to be conducted by researchers at UofG, GTI, Kemptville and Ridgeway.

Technology transfer occurred back to the sponsor, as well as, the industry in general through reports and the GTI/OTRF Annual Turf Research Field Day, as well as research presentations at the Ontario Turfgrass Symposium. Research reports continue to be offered and expanded via the GTI World-Wide Web Internet site.

POTATO

Significant Research Accomplishments

Management of potato scab using organic amendments (G. Lazarovits. AAFC, London)

Organic amendments have proven to be extremely useful to manage soil microbiology and fertility. This project will continue examining the mode of action of these products and improve their formulations so that the amounts to be applied in commercial fields is reduced while making them more universally effective in different soils.

Monitoring changes in susceptibility of selected populations of Colorado Potato beetle (CPB) to Admire.(J. Tolman. AAFC, London) No significant changes in susceptibility to Admire were detected in several CPB populations collected in Ontario during the 2000 season

Management of wireworms attacking potatoes. (J. Tolman. AAFC, London) Several insecticides were evaluated for their effectiveness against wireworms. Fipronil provided good control of wireworms. The number of insecticides screened will be expanded in 2001 to include Aztec and a biological control agent.

Variety Trials. Sam Squire, the Potato Board Provincial Coordinator for variety testing conducted the 2000 variety trials in Leamington, Alliston and Shelburne. Cultivars from the New York, Michigan and Quebec breeding programs were evaluated. The results of the trials were presented at the Potato Board meeting on December 6, 2000. For the white flesh table market, several worthy new lines were selected. Some of these varieties will be grown in commercial fields in 2001

Sam's expertise on Variety Testing is invaluable for Ontario potato growers who are now able to see by themselves how these new varieties perform in their own backyards. Advanced lines from the Fredericton breeding program were tested at the Cambridge Research Station (V. Currie) Other lines evaluated at this site included some from the now defunct Guelph breeding program and from the North Central Regional Adaptation Trial.

Eugenia Banks (OMAFRA) conducted strip trials in several sites across the province to evaluate the performance of new varieties in growers' fields

Minituber Production. (B. Hughes, SPUD Unit, NLARS, U.of G.)

Research trials have identified superior fertility treatments for greenhouse Nuclear minituber production of several cultivars. However these superior treatments are actually detrimental to the yields of other cultivars. Research is continuing in this area to provide fertility regimes which increase the yields and improve the size distribution of the main cultivars in the seed program. With increased fertility, excessive top growth has become a problem in the minituber crops. A growth regulator is being tested for its effects on plant growth, yield and carryover effects in the field.

The SPUD Unit, OSPGA, Ontario Potato Board and a German biotechnology company have submitted an application to Healthy Futures for Phase 1 of a project to produce antibodies in potatoes for the food safety and other industries.

Evaluation of the seed treatment MAXIM and the insecticide ACTARA for CPB control

(E. Banks, OMAFRA) The effectiveness of the seed treatment Maxim and the insecticide Actara was evaluated in 3 sites: Exeter, Grand Bend and Hillsburgh. No significant differences were found between Maxim and Senator (Easout).

Actara provided very good control of all CPB stages when applied as an in - furrow treatment or as a foliar spray. Growers would prefer a liquid formulation for the foliar application rather than granular.

Control of Rhizoctonia Black Scurf with Quadris. (E. Banks, OMAFRA) Quadris applied in furrow provided very good control of Rhizoctonia Black Scurf.

Nitrogen Requirements of New Yellow Flesh Varieties (E. Banks, OMAFRA)

The new varieties Fabula, Caesar and Amadeus performed very well at low/ medium Nitrogen rates.

Provincial Survey of Nematodes and Verticillium (E. Banks, OMAFRA) A total of 229 soil samples taken from potato fields across the province were analyzed at the Pest Diagnostic Clinic to detect the levels of Nematode and Verticillium infestation. In soils with high organic matter, there were low levels of Verticillium. High populations of nematodes were found in sandy soils where the variety Superior was grown. In fields where there was a high nematode population but Verticillium was not detected, the crop did not show symptoms of nematode damage.

Low Temperature Storage Physiology (R.Yada, L. Copp, U.of G.). A pathway has been identified which may lead to improvements in low temperature storage via conventional breeding or genetic modification.

Service Accomplishments

- The New Liskeard SPUD unit, the tissue culture center of the Ontario Seed Potato Industry, continues to produce nuclear mini tubers to supply the seed requirements of 70% to 80% of Ontario seed growers. In 2000, the SPUD Unit maintained 35 cultivars *in vitro* and produced approximately 35,000 potato plantlets.
- The Potato Session of the Horticultural Crops Conference was very well attended and participants had the chance to taste french fries at the French Fry Bar sponsored by Zeneca.
- The Ontario Potato Update Newsletter was issued 4 times during the 2000 season. Growers received the newsletter by either e-mail, fax or regular mail. In addition the Potato Board mailed to all growers the OMAFRA Late Blight Strategy, and a Potato Wart factsheet.
- The Potato Board and OMAFRA worked closely to obtain the emergency registration of Quadris and the emergency registration of aerial spraying of Admire
- The Potato IPM Manual for potato scouts was updated in 2000. It provides useful information on how to identify potato pests and how to monitor fields.
- Twenty students attended the Training Sessions for potato scouts. The Sessions were conducted the last week of May in Alliston and at the end of June in Shelburne. Practical training took place in potato fields.
- A Potato Field Day was held in August in Alliston. The field day included a display of new varieties at the Research plot of the Potato Board, field demonstration of a new harvester and display of potato equipment

- In November, a Display of Potato Varieties at OMAFRA (Guelph) was very well received. It was a good opportunity to create awareness of the many varieties grown in the province.

SWEET CORN

1. Weed Management:

Herbicide evaluations for minor use registrations continue at Ridgetown College, and University of Guelph (Simcoe). Herbicides presently being evaluated for minor use registrations in sweet corn include: Mesotrione, Dual II Magnum + Atrazine + Linuron. Products in the URMULE system include Accent, and Liberty.

2. Disease and Insect Management Trials.

Fungicide and insecticide trials continued at Ridgetown College, and include work on European Corn Borer (ECB) insecticide trials, seed treatments for the control of flea beetles (vectors of Stewart's Wilt) and thrips, and corn leaf rust control trials.

3. Variety Evaluations.

Processing variety trials were conducted at Ridgetown College and the Huron Research Station. Fresh market variety trials were conducted at Ridgetown, Harrow and New Liskeard. Due to lack of funding there were no trials in Simcoe or Kemptville this year.

4. Management Studies

Management studies evaluating optimum nitrogen rates and nitrogen use efficiency of sweet corn grown on plastic mulch compared to bare soil, and the use of IRT mulches in sweet corn production were conducted at AAFC Harrow.

TENDER FRUIT

Significant Research/Service Accomplishments

- Tender Fruit Grapevine technical newsletter published six times per year and delivered to 650 growers and 150 research, extension and industry personnel. Mailing costs were paid for by the OTFPMB. *Slingerland*
- Site selection recommendation led to establishment of a processing cling peach trial at Vittoria - potential site for expansion of processing peach production outside of Niagara *Slingerland, Evans (Nabisco), Grower*
- Sweet cherry pruning demonstration. *Slingerland, Tim Fecteau (Oregon)*
- CanAdapt pear project (fire blight tolerant pear selections for processing) - grower information meeting and Nabisco plant tour. *Slingerland, Evans, Nabisco, Hunter, 26 growers*
- Over 100000 samples collected and evaluated for presence of plum pox virus (PPV). *Ferguson (CFIA)*
- Plum pox - draft research plan prepared for discussion purposes only. *Neish (AAFC), CFIA*
- Plum pox workshop held with input from Europe (Spain, France) and USA (Pennsylvania).

OTFPMB

- Sour cherry processing grade standards changed to USDA Standards for Tart Cherries for Manufacture. OMAFRA- Food Inspection Branch Branch trained, accredited and audited cherry graders. *van Weerden*
- Approx 65 samples of stone fruit or pears were analyzed for chemical residue and some additional samples tested for microbial contamination under the Food Safety Monitoring Program. The number of pesticide residue violations was down again in 2000. *van Weerden*
- Two blue plum cultivars, 'Valerie' and 'Vanette', named in 1999 were granted Plant Breeders' Rights in 2000. Other plums and sweet cherries showing promise propagated through OFTA. *Lay*
- NC-140 sweet and sour cherry trial produced first crop in 2000. *Lay*
- Sweet cherry performance trial at Cedar Springs is on-going, but Sour Cherry performance trial was terminated for lack of interest. *Zandstra*
- Fresh and processing peach cultivar evaluation orchard established at Cedar Springs. *Zandstra*
- 'Venture' processing cling peach introduced. *Miles, Guarnaccia*
- Canadian Clonal Gene Bank has 294 *Prunus* accessions and 99 *Pyrus* accessions. Requests for *Prunus* germplasm were filled in Feb. and Mar. but other requests were not filled pending verification of plum pox status of Gene Bank holdings (all accessions tested were negative). There were 7 requests (10 accessions) for *Pyrus* germplasm. *Luffman*
- Transgenic 'Bosc' pear are being transferred from tissue culture to greenhouse conditions for further evaluations of fire blight resistance. *Hunter*
- US Plant Patents were issued for 'AC Harrow Dawn' and 'AC Harrow Fair' peach, and for 'AC Harflame' nectarine. *Hunter*
- Control of fire blight using elicitors of a systemic acquired resistance (SAR) response continue to show promise in greenhouse and field tests. *Svircev*
- Thesis on the use of bacteriophages to control fire blight bacteria was successfully defended at Brock University. *Svircev, Brock University*
- Tissue culture and transformation work on peach is continuing at a reduced level pending additional funding. *Brown*
- Elite (tebuconazole) and Medallion (fludioxonil) are very effective fungicides for post-harvest treatment of peaches to control brown rot and rhizopus rot. *Northover*.
- Black knot ascospores released from plum knots between April 19 and June 16, and from sour cherry knots between April 19 and June 26. Orchard trial established to determine efficacy of Vangard, Indar, Topas, Sovran and Bravo against plum black knot. *Northover*.

Most other programs reported in the 1999 report are continuing in 2000.

TOMATOES

Major Accomplishments And Committee Activities

Breeding and cultivar evaluation. Resistance to powdery mildew, bacterial canker and anthracnose has been moved into advanced lines. The anthracnose resistant material looks particularly promising. Heinz and Nabisco are using germplasm released from the breeding

program in their company programs. Crosses are also being made to broaden the genetic base of adapted tomato. Cultivar evaluation of processing and fresh market varieties continues. Dr. Chunlin He was appointed to a PDF position at AAFC, Harrow, working in the breeding program to develop molecular markers for genes conferring resistance to diseases such as bacterial canker, anthracnose and powdery mildew.

Paclobutrazol (a triazole growth regulator) was shown to improve quality of plug transplants and advance the harvest maturity of processing tomato. Nutrient 'charging' of plug transplants was used to improve size and quality of transplants.

Crop protection. Six URMULE applications were prepared and submitted to PMRA for minor use registration of herbicides for fresh market tomato and one URMULE was submitted for both processing and fresh market tomatoes. Work is continuing on weed control and crop tolerance evaluations in processing tomatoes. Residue samples (as required by PMRA) were collected to support the registration of Pinnacle.

An URMULE was submitted for Kocide 101 for the control of bacterial diseases on tomato and pepper seedling plug transplants. PCR technology has been successfully used to screen small lots of seed for the bacterial spot pathogen and the technique is being improved to screen larger seed lots.

Fungicides were evaluated for their relative effectiveness against late blight. Two new fungicides with different chemistries were identified that outperform Quadris in controlling the common fungal diseases and also were extremely effective in controlling late blight.

Two new insecticides showed outstanding control of Colorado potato beetle.

GLP compliancy. Site certification for AAFC, Harrow is in progress.

Extension activities. Information on late blight was updated during 2000 and posted on the OMAFRA web site. Grower meetings were organized to discuss reduced tillage systems for processing tomatoes and to observe ongoing research in this area. Good liaison between plant pathologists and the industry occurred to address the disease problems which occurred. More formal alliances were arranged with US growers and processors to coordinate, on a regional basis, solutions to problems.

STATE OF THE INDUSTRY

AGROFORESTRY

University of Guelph

Submitted by: Naresh Thevathasan, Research Scientist, University of Guelph

Some additional funding and support was received for agroforestry research during the year 2000. In addition to the OMAFRA contribution, funding was received from the Centre for Research in Earth and Space Technology (CRESTech), NSERC (industrial scholarship), NSERC University Research Assistantship (URA), and assistantships from the Ontario summer experience program and the Ontario work-study program. There were also in-kind contributions from researchers in the department of Land Resource Science, ThinkSpace Inc. and visiting scientists from the Republic of China.

The Agroforestry Research Site (a CFI Site, see 1999 report) also received funding for two tile drain monitors during the year 2000 from the Canadian Foundation for Innovation (CFI) program (total value approximately \$30,000). This also implies that a niche for Agroforestry research is currently being formed among a diverse group of stakeholders mainly attributed to advances in agroforestry research in southern Ontario. The Department of Environmental Biology has been able to make significant progress in its research, especially research at the tree crop interface and resource utilization.

The Victoria Road Agroforestry Research site is currently being tested as a "ground truth" site for remote sensing applications with the help of CRESTech funds. The fact that agroforestry practices were selected for the above program also indicates that these types of land use practices have been identified in Southern Ontario as those promoting the stewardship of land and water resources. The latter development is expected to attract more environmentally concerned stakeholders to land use management, which incorporates the principles of agroforestry.

The research site at the University of Guelph has now been established for 13 years and biophysical and ecological interactions at the tree-crop interface are beginning to become more prominent. More funding has been sought from stakeholder groups so that these interactions can be quantitatively measured in the future. The University of Guelph Research Site remains the only site in Canada where tree-crop research is replicated in a research design.

Ontario Soil and Crop Improvement Association (OSCIA)

Submitted by: Andrew Graham, Program Advisor, OSCIA

Ontario Environmental Farm Plan (EFP)

Local EFP workshops will continue to be offered to Ontario farm families in the upcoming months. A growing number of attractive soil and water programs offered through the conservation authorities and municipalities are requiring an EFP deemed appropriate as eligibility criteria. This is in addition to the current \$1,500 EFP Incentive Program. Over 18,500 farmers have voluntarily participated in the self-assessment exercise. Of these, about 11,000 have submitted for peer review and have successfully deemed appropriate. To date, 8,000 farms

have claimed the incentive grant, which equates to a \$10.3 million in federal contribution for on farm projects.

A detailed EFP Indicator Study was coordinated by the Ontario Soil and Crop Improvement Association (OSCIA) for the Ontario Farm Environmental Coalition (OFEC) in the final months of 1999. The data analysis and the March 2000 Final Report was prepared by the University of Guelph School of Rural Planning and Development. Findings indicate that EFP participants have progressed well through their action plans addressing 52 % of their worksheet concerns. Barriers most often associated with not completing specific actions include financial costs and other personal priorities. The survey also verified that EFP participants have additional motivation and knowledge to manage environmental risks on their farms. Sixty-one percent of the statistically significant number of participants surveyed had undertaken environmental actions in addition to those identified in their EFP. The full report is available on request from OSCIA.

The third edition of the EFP workbook is underway. OMAFRA staff with Environmental Management is coordinating the effort. All 23 worksheets will be reviewed and revised appropriately through appointed expert panels. New environmental priorities will be incorporated into the workbook too.

Restoration of American Chestnut - Farm Response to a Species at Risk

This has been identified as an ongoing project in the 1999 Subcommittee Report. This two year demonstration project ended in March of 2000. Project goals were achieved through an educational and awareness campaign and a network of 24 planting demonstration sites, coordinated by OSCIA with assistance from many partnering agencies and organizations. The final report for the project, including a compilation of site data, photographs, maps, news releases and other pertinent information, is contained on compact disc from OSCIA.

Wildlife Impact Assessment for Ontario Agriculture

This work was conducted by OSCIA on behalf of the Ontario Agricultural Commodity Council, to investigate the economic impacts of wildlife on agriculture on a sector and species-wide basis. Wildlife impacts were quantified through a one-year scientific approach. The study focused on wildlife caused losses that occur directly to standing crops and livestock through a comprehensive survey of five commodity sectors: field crops (corn, wheat, soybeans, forages), fruits, vegetables, beef and sheep. While the full range of wildlife species was addressed, the major emphasis was placed on deer, geese, raccoons, coyotes, wolves, dogs, blackbirds and other species of birds. The study also investigated prevention measures, compensation mechanisms, access to advice and recommendations for next-steps. The issue of wildlife caused losses is not one to be faced by the farm population alone, but requires the attention of conservation groups and society as a whole wishing to protect species and enhance habitat. The final report is available on request from OSCIA.

Evaluation of Buffer Strips along Watercourses on Ontario Farms

This was identified as an on-going project in the 1999 Agroforestry Subcommittee report. The investigation and analysis has been completed. Forty farm buffer projects were visited and the

landowners were interviewed. The final report was submitted in February 2000 and is available on request from OSCIA.

Ontario Maple Syrup Producers' Association (OMSPA)

Submitted by: Dave Chapeskie, R.P.F., Agroforestry Specialist, OMAFRA

There are about 1,200,000 taps placed on 2,000 farms annually in Ontario. The commercial industry in Ontario generates an estimated \$15 million dollars from the sale of Maple products annually. The maple industry is seen as a growth industry with about two-thirds of the syrup consumed in Ontario being imported. Modest growth of the industry has occurred over the past decade no doubt tempered by high establishment costs facing prospective producers.

The 1999 crop of maple syrup was considered good in most parts of the province. The crop was normal in the central and eastern parts of the province but lower than expected in southwestern Ontario. Yields were strongly influenced by regional weather patterns.

The effects of the 1998 and 1999 drought on yields in southwestern Ontario are unknown. Preliminary research results from the applied research designed to determine the effects of the 1998 ice storm on productivity in eastern Ontario are now available. This research shows some negative affect on productivity where damage is severe but the effects of the storm on overall production are not known.

The Ontario Maple Syrup Producers' Association (OMSPA) has been active in developing and promoting a voluntary quality assurance or Seal of Quality Program (SOQ) for its members. About 100 maple producers have signed up for this program which is analogous to the Vintners Quality Assurance Program (VQA). A second edition of the SOQ Manual will soon be released.

OMSPA is actively supporting applied research and extension initiatives supportive of the maple industry. The organization has an active research and technology transfer committee which works closely with OMAFRA Specialists to identify and guide worthwhile project initiatives.

Society of Ontario Nut Growers (SONG)

Submitted by: Doug Campbell, Representative, Commercial Nut Growers

The year 2000 season started early for nut crops but then was delayed in mid season with cool and rainy conditions. The fall weather was favourable but late summer droughts were limiting factors in some areas (e.g. Niagara).

It was a good year for hazels. Growers are starting to realize that the planting of blight resistant strains of hazel is a necessity.

Sweet chestnut crops were very good in spite of rainy periods during the pollination season. Crops were somewhat heavier than in 1999 with market prices remaining strong at \$2.00-\$3.00 per pound in the shell. The markets are very receptive to the Ontario grown product and would accommodate at least ten times the current level of production. Since production rates of 2,000 pounds per acre are easily reached, this is a potential profit maker.

The early wet season made it difficult for English walnut. Walnut blight was severe and crops were limited unless a rigorous spray program was followed.

Although 2,000 has not been as good a ripening year for northern pecan as 1999, quality has still been maintained at a high level and production has doubled. The fresh quality of Ontario grown pecans is well received by the markets. There is a great opportunity for growing more northern pecan in Ontario. Northern pecan is well suited to area along the north shore of lake Erie.

Total nut production in Ontario continues to rise at incremental rates with a current annual value of \$350,000. New production areas will continue to come on stream over the next few years. Most currently producing orchards are less than 10 years of age.

Ministry of Natural Resources (MNR)

Submitted by: Eric Boysen, Private Land Policy Advisor, MNR

Managed Forest Tax Incentive Program (MFTIP)

<http://www.mnr.gov.on.ca/mNR/forests/mftip/htm>:

The MFTIP evolved from the Managed Forest Tax Rebate Program in 1998. Woodlands must be a minimum of 10 acres (4 hectares) to qualify, and must have a Management Plan approved by a Management Plan Approver. Eligible properties are first re-classed from residential into a Managed Forest Tax class and property taxes are then reduced in a two-step process: land value is first reassessed equivalent to farm land and then taxed at 25% of the residential tax rate.

In 1999, 9,300 properties totaling 1.5 million acres (607,300 hectares) were participating. Twenty-nine percent planned to conduct a commercial harvest, 51% planned to harvest trees for personal use and 48% ranked environmental protection as a primary objective.

After five years, MNR is currently conducting an internal program review.

Ontario Stewardship (originally called Private Land Resource Stewardship Program) - <http://www.ontariostewardship.org>:

This program was initiated in 1995 in response to MNR's exit from the operational private land forestry program. There are now 40 Stewardship Councils across southern and central Ontario.

To facilitate operation of the Councils MNR provides a staff member (Stewardship Coordinator) and \$10,000 per year in seed money to each Council. Seed money is invested in community level projects, and is often leveraged with other money. Volunteer hours are tracked and reported to show total amount invested in private land stewardship.

Many stewardship councils have representatives from the agricultural community, but each council is generally reflective of the landscape it serves.

In 1999/2000, 3,955 volunteers contributed 58,602 volunteer hours. Investment in the Ontario Stewardship Program from partners was \$7.3 million in cash contributions and \$6.4 million from in-kind contributions.

Stewardship Councils successfully apply to Trillium Foundation, Healthy Futures Program, Human Resources Development Canada, Ontario Works, Canada Trust and other programs.

Tree Cutting By-laws:

Municipalities can pass tree cutting by-laws either under the Forestry Act at the county level or under the Municipal Act for a lower tier municipality with a population of less than 10,000 people.

Currently 21 counties have by-laws under the Forestry Act, and 13 municipalities with tree conservation by-laws under the Municipal Act. There has been a recent interest in stronger enforcement, especially where there is urban sprawl. For example, York Region successfully charged a logger under their by-law resulting in a \$96,000 fine and three months in jail.

Many by-laws are being modernized to be more reflective of proper forestry practice.

Clearing for agriculture is often exempt from the by-laws, prompting many developers to claim forest clearing for agriculture, then going for development approval after.

Science, Training and Technology:

The Ministry of Natural Resources still provides many extension level courses and workshops geared towards farmers and rural landowners. A tree markers certificate course is offered annually at the Frost Centre. Certified Tree Markers must be utilized on Crown lands but are optional on private lands. A southern Ontario version of the tree marking course is offered near Turkey Point to deal with more southern issues.

MNR has released a publication entitled "A Silvicultural Guide to managing Southern Ontario Forests". The tree marking courses are designed to implement the recommendations contained in this manual which defines both proper and improper forestry practices. Improper practices include allowing woodlots to be grazed by cattle and other livestock.

The 24th Annual Forest Health review was held in Orillia. Plum Pox, Pine Shoot Beetle, West Nile Virus and Long Horne beetles were discussed.

MNR continues to sponsor or participate in woodlot shows such as the Outdoor Farm Show, the International Plowing Match, the Hastings Plowing Match, and a number of annual woodlot conferences in southern Ontario. Individual Stewardship Councils offer local awareness and education opportunities for local landowners.

The Forest Gene Conservation Association organized and delivered four seed collection and handling workshops, training about 100 participants in techniques designed to ensure seed source control and genetic integrity.

Survey of Ranchers, Farmers and rural Landowners-

<http://www.whc.org/publication/24-10-00-e-htm>:

A group of national and Ontario agencies sponsored a benchmark survey of rural landowners in spring 2000. The survey was conducted by Environics Research in Toronto, and was officially released by the Federal Agricultural Minister Lyle Vanclief at the Royal Winter Fair. The survey asked questions related to attitudes, needs and activities surrounding private land stewardship. In Ontario, 1,215 people, 795 farmers) owning 25 acres (10 hectares) or more were contacted. Complete details are contained in the report.

Climate Change Research Activities:

MNR is conducting several background investigations into the role that afforestation could play in the sequestering of carbon (i.e. carbon sinks).

The Rural Landowner survey contained questions specifically related to programs and incentives required by landowners of marginal agricultural lands. Some reports estimate close to one million acres (400,000 hectares) could and/or should be planted to trees across Ontario. MNR is investigating "how much, where, and other operational aspects of these questions". Silv-econ consultants are preparing a background report on historical tree planting programs and MNR is investigating nursery capacity and willingness to produce suitable planting stock in adequate numbers. MNR is working with partners such as Ontario Power Generation, Conservation Authorities and stewardship councils to determine best bets.

Forest Fragmentation and Parcelization:

There is increasing concern about the continual erosion of the productive and potentially productive land base due to urban sprawl. The United States has developed "Smart Growth" programs, which restrict urban sprawl through strategic investments in infrastructure, and disincentives against new development. Other States have "Rural Legacy" programs, which keep rural areas intact for agriculture and forestry.

Notes are available from a conference, which was held on fragmentation in 2000.

Ministry of Agriculture, Food and Rural Affairs

*Submitted by: Dave Chapeskie, R.P.F., Agroforestry Specialist and
Todd Leuty, Agroforestry Specialist*

Maple Syrup Industry:

Regional weather patterns continue to be the predominant factor affecting yields of sugar bushes across Ontario. After mediocre crops in eastern and central Ontario in 1998 and 1999, yields improved in 2000. This was particularly encouraging in the area, which was impacted by the 1998 ice storm. In contrast, yields were down in southwestern Ontario after several years exhibiting normal yields. The impacts of drought, ice storms and other natural disturbances appear to be masked by regional weather factors.

Overall provincial yield in 2000 was up by 60% over 1999, with a production of 1,686,000 litres worth \$17,700,000 in syrup sales. It is expected that most Ontario

produced syrup will be sold at the farm gate, retail and farmers market outlets without difficulty. It should be noted that at the present time there is a surplus of syrup in Quebec, which could invariably increase the amount of syrup imported into Ontario, particularly the eastern areas. The main affect of this surplus is expected to be a depressed price for bulk syrup.

It is evident that a significant number of existing maple producers are considering expansion of their enterprises and a noticeable number of others are considering entering the industry for the first time. Expansion of the industry will be tempered somewhat by the level of capital investment required to establish or expand a maple enterprise.

A new publication entitled "Economics of Maple Syrup Production " was co-published by the Canadian Farm Business Management Council and the Ontario Ministry of Agriculture, Food and Rural Affairs. This publication is proving to be very popular in Ontario and elsewhere. It will be an important aid for maple producers considering expansion, new beginners and others. OMAFRA continues to work with OMSPA and MNR to strengthen Ontario's contribution to maple research efforts. In 2000, Ontario hosted an International Conference featuring research activities related to ice storm recovery.

Christmas Tree Industry:

Ontario's Christmas tree industry is believed to be in a steady state at the present time. An estimated 600,000 trees are harvested annually. A variety of species are grown including scotch pine, white spruce, balsam fir, fraser fir and others. In recent years, consumers have shown a preference for fir over the other species.

Most Christmas tree growers in Eastern Ontario have largely recovered from the effects of the 1998 ice storm. Drought has been a problem in some areas and a few growers are evaluating the costs and benefits of trickle irrigation.

There continues to be a need for more weed control options particularly herbicides to control triazine resistant weeds.

Nut Tree Industry:

The commercial nut tree industry has its greatest potential in southwestern Ontario where the regional climate is moderated. At present, an estimated 2,500 acres (1,012 hectares) have been established. Most of the plantations are less than 10 years of age. A variety of species are being planted including black walnut (highest yielding cultivars) english walnut, Japanese heartnut, northern pecan, hazelnut and sweet chestnut. In eastern and central Ontario, the potential for the nut tree industry is more limited and has not been fully assessed. There are a number of demonstration sites in Eastern Ontario.

Testing of mechanized cracking equipment began this season following the purchase of equipment from Texas. SONG is most interested in commercial-scale cracking of heartnut walnuts and other mechanization of orchard management.

Grower awareness regarding the need for good site selection and intensive management is paramount. There is a great need to test and register pesticide options for weed and insect control in nut tree plantations.

SONG and the evolution of an Ontario nut orchard industry may prosper faster if they associate themselves with an orchard commodity research subcommittee, such as the tender fruit or pome fruit research subcommittees, in addition to the agroforestry subcommittee.

Farm Woodlots:

OMAFRA continues to provide technical support for regional woodlot conferences and to a lesser extent more local seminars and workshops.

OMAFRA has also worked closely with MNR in helping guide research designed to study the effects of the ice storm on woodlands.

The ministry continues to promote the value of farm woodlots as an integral part of the whole farm enterprise as well as the value of windbreaks and shelterbelts on farms.

Non-timber Forest Products:

Non-timber forest products continue to gain interest. Woods-grown ginseng, other forest herbs and woods-mushrooms are gaining a significant foothold in markets. Theft or poaching of forest plants is a concern. Producers of woods ginseng currently prefer that OMAFRA not educate other landowners on the techniques of forest ginseng to enable them to capitalize on an extremely valuable market. One information sheet is in the process of being posted to the OMAFRA web on "Producing Non-Timber Forest Products" which describes forest herb farming and mushroom production.

Intercropping Trees and Annual Crops:

Two information sheets are now posted on the OMAFRA website describing practical applications of modern intercropping. The farmers have generously shared their ingenuity on intercropping techniques with OMAFRA. As a result of one-on-one interaction with extension, their technology has been assembled and delivered back to the agricultural industry.

APICULTURE & POLLINATION

Current State of the Industry (D. McRory)

This year has not been a particularly good one for honey production. The Ontario crop will be in the 70-90 pound range. This is down considerably from the last two seasons. The price of bulk honey has not recovered from last year's low and currently is in the \$0.70-0.75 per pound range. The honey that has been produced is of excellent quality. Due to the carryover of honey from the past two seasons, there will be sufficient supplies of honey to meet the demand. As the price is low, beekeepers will try to maximize their returns by adding value to the bulk product by packaging it and selling it through a variety of sales outlets.

Varroa mites have spread to all areas of Ontario except Thunder Bay and Manitoulin Island.

Beekeepers who have been following all the recommended treatments and have been re-queening with hygienic bees, the varroa population has remained low through this season. No resistance to Apistan® has been detected in Ontario. Beeswax and honey samples sent to Germany showed exceptionally low residues of Fluvalinate from the use of Apistan®. Only one sample of honey was found to contain Apistan®. This was honey extracted from the brood chamber combs and would not have been used for human consumption. Residues of pesticides not registered in Canada have been found in foundation from other countries. It is advised that beekeepers use the unsprayed plastic foundation or check out where their foundation wax originated. Some beekeepers are arranging to have their own wax made into foundation.

Honey Bee Tracheal Mites (HBTM) continue to spread slowly through Ontario with about 40% of the bees now infested with both Varroa and HBTM. The spring application of Formic Acid in the single application pads along with the use of HBTM resistant queen bees is doing an excellent job of keeping this disease below economically damaging levels.

Resistant American Foulbrood (AFB) has not been detected in Ontario. It has been found in bee operations in Alberta and British Columbia. Because of the AFB resistance in BC and Alberta, no permits to bring live bees from those provinces will be issued. Equipment can be brought in if it is irradiated. To reduce the risk of developing resistant AFB in Ontario, it is recommended that beekeepers kill all bees in colonies that are positive for AFB. This is a change from the previous recommendation which was to shake the bees onto the foundation. The combs should either be burned or irradiated. Ontario beekeepers need to be very vigilant for the first signs of AFB. Immediate action should be taken (destroy these colonies by fire or have the equipment irradiated) when AFB is found.

Sweet corn spray problems have not been reported by beekeepers this season. The next two seasons will be important to see if this year's observations will be repeated. A great deal of work was put into developing a "Best Management Practice for Preventing Damage to Honey Bees" by beekeepers, corn processors, Aerial applicators, OMAFRA and MOE. This protocol was used this past season. It will be refined over the winter of 2000-2001.

Small hive beetles (SHB) have not been found in Ontario. Ontario bee inspectors have been monitoring the SHB with New York bee inspectors in New York State and Ontario. They have found the SHB is right across the border from the Niagara Region and along the St. Lawrence River in New York State. It is also reported that The SHB was found in Michigan State.

In Ontario, bee inspectors have started mapping the apiaries. They use 16 hand held GPS to find the coordinates of each apiary. These coordinates are reported and recorded.

"What is happening about the African Bees?" is a question that is always asked of beekeepers. Currently they are located from Texas across the southwest to California and continuing to expand their range. We do not expect that African Bees will survive this far north, as they are tropical bees that turn all of their honey resources into bees that swarm. They will starve in our climate.

APPLES

The 1999 crop was anticipated to reach 16 million bushels but in fact reached 17,392,000 bushels or 41% above the 5-year average. This was the largest crop produced in Ontario since the early 1930's before extremely cold weather killed a very high percentage of the trees in the Province.

Hot weather during the 1999 harvest advanced fruit maturity quickly and grade-outs at the packing lines over the winter were the highest in many years. Poor grade-outs coupled with the very large crop in Eastern North America resulted in very low returns to producers. Many tons of juice apples were abandoned at harvest and not accounted for due to the lack of a market for juice apples late in the season. Some surplus juice apples were shipped to the Lassonde plant in Quebec and made into concentrate under the Agriculture and Agri-Food Canada Price Pooling Program. A late start on the project affected the quality of the concentrate and returns to participating growers were disappointing.

As the 1999 crop was marketed through the winter, spring and early summer months of 2000 it became apparent that returns would be down in the range of the disastrous 1992 crop year. In the end returns were a severe financial blow to producers and a number of bankruptcies were reported as financial institutions bowed out or refused to participate further.

The 2000 Crop

Fruit set in 2000 was light as dry weather in the two previous seasons affected the trees' ability to produce fruit buds, and, wet, cool weather and frost at blossom time this spring reduced the total crop. Cool temperatures made fruit thinning a challenge. Moisture levels ranged from more than adequate to extreme in some areas causing severe scab outbreaks. Insect damage showed up in most growing areas and hail damage was higher than average.

On the plus side moisture conditions resulted in well-sized fruit. The estimate for the 2000 apple crop is approximately 13,000,000 bushels. The following table shows crop utilization.

<u>Fresh Consumption</u>	<u>Processing</u>	<u>Juice Apples</u>
7,683,000 Bu. (59%)	1,157,000 Bu. (9%)	4,160,000 Bu. (32%)

Nov. 1 storage holdings indicate less fruit in storage this year than last. This more manageable crop should allow for better returns. The OAMC has recently developed a markets information system that determines average weighted prices for the province to provide information to marketers to keep them more knowledgeable of market developments.

Worldwide overproduction is likely to be a problem again this year as it is for most apple-producing countries. A very large Washington State apple crop is already adversely affecting Ontario prices and market demand.

Exports to the U.K., our largest export market, hit record levels last year (471,000 boxes). Main varieties for export include McIntosh, Empire and Red Delicious. Further promotional efforts with U.K. retailers are aimed at expanding these markets.

BERRY CROPS

The Ontario berry crop industry remains stable. After a number of years of declining acres, there was a slight increase in the number of acres of berries picked in 2000 (Table 1). Farm gate revenues of approximately \$ 22.7 M were reported for blueberries, raspberries and strawberries in 1999 (OMAFRA). Most berries are sold at the farm gate, pick-your-own or through wholesale markets. The processing industry remains small.

Table 1. Acres harvested and farm value of blueberries, raspberries and strawberries in Ontario over the last four years.¹

Crop	Acres Harvested				Farm Value (\$'000)		
	1997	1998	1999	2000 ²	1997	1998	1999
Blueberries, High Bush	---	370	410	380	1,455	2,055	2,050
Blueberries, Low Bush	---	65	30	30	375	105	75
Total Blueberries	550	435	440	410	1,830	2,160	2,125
Raspberries	1,100	1,110	975	930	3,740	3,505	3,230
Strawberries	4,000	3,955	3,600	3,785	17,350	17,430	17,360
Total	5,650	5,500	5,015	5,125	22,920	23,095	22,715

¹ Source - OMAFRA website.

² Preliminary report only. Value of 2000 crops not available.

After two hot, dry growing seasons, the 2000 growing season was cool and wet in most parts of the province.

Excessive rainfall was a problem during **strawberry** season in the south and southwest, resulting in poor crops for 75% of strawberry producers in Ontario. PYO was down significantly due to frequent rainfall during harvest. Fruit diseases, such as anthracnose, and leaf diseases were widespread. Strawberry growers in central, eastern and northern Ontario fared better with average to above average crops. Weed control was problematic in most areas. There has been a sudden interest in the use of trickle irrigation in strawberries due to water quality concerns. Across the province, **raspberry** yields ranged from average to 60% below normal. The Raspberry Yield Analysis Project showed yields were down substantially (25-60%) in SW Ontario compared to last year but were generally equal to or above last year's calculated yield on farms in Eastern Ontario. The lower yields were attributed to fluctuating winter temperatures and cool, wet weather. Cane diseases were very prevalent.

It was an average year for **blueberries**. Bird control continues to be a problem in high-bush blueberries.

The annual **cranberry** production for Ontario is estimated at just over 500 thousand pounds. There are four cranberry farms in the province with only three producing in 2000. The

wholesale price of cranberries is still below the cost of production, but lower production in other parts of North America may change that.

The Ontario Berry Growers Association (OBGA) continued its support of berry crop research in Ontario in 2000. As well, the OBGA continues to manage the Ontario Berry Crop Plant Propagation Program and to pursue plant breeders rights agreements on new berry crop cultivars. The OBGA has approximately 250 grower members from all across Ontario representing about 80% of the strawberry and raspberry production in Ontario.

CRUCIFER CROPS

General Conditions: As with many growing seasons, the weather is a key factor to our successes and challenges. In 2000, the cool, wet conditions across much of southern Ontario led to higher than normal disease pressures and in general lower insect pressures. Crop nutrition and weed control were also concerns in many waterlogged fields. Prices were generally better in 2000 than 1999, but were offset by higher fuel and carton costs. Cabbage maggot control options are the main concern of rutabaga growers. The newly identified pest, the 'swede midge' is a major concern for crucifer growers in York, Durham and Northumberland regions. Asian crucifer crops continue to suffer from turnip mosaic virus, poor pest control options and crop nutrition problems.

Production Statistics: The estimated acreage of crucifer vegetables is shown in Table 1.

Table 1: 1999 Production of Cruciferous Vegetables in Ontario¹

	<u>Acreage</u>	<u>Farm Value (\$'000)</u>
Broccoli	2,000	4,570
Brussels sprouts	340	430
Cabbage, Asian	800	1,950
Cabbage, Other	3,355	9,300
Cauliflower	2,775	9,100
Radish	430	1,370
Rutabagas & turnips	1,830	5,015
Other Asian-type crucifers	2,000	N/A
<u>TOTAL</u>	<u>13,530</u>	<u>approx. 32,000</u>

¹OMAFRA

Pest Management Programs

Many growers of cole crops monitor their own fields or have a consultant checking the crop regularly. The AIMS group also provided scouting and regional agriphones in 2000 for some cole crop sites. Trap crop trials with collards for diamondback moth were also tested on some grower sites in 2000 with success. IPM programs for rutabagas are no longer delivered by any agency or persons.

GINSENG

The 2000 season has been difficult. The result of prolonged wet and cool conditions has been increased root disease and the forced harvest of younger gardens.

Crop size:

Ontario: 3.4 million lbs, down from 1999, projected down further in 2001
1 – 1.5 million lbs sold or consigned as of Dec 12th, 2000
Wisconsin: 600,000 lbs, down from 1999, projected down further in 2001
B.C. 2 million lbs, stable, projected stable in 2001

Crop prices:

\$20 - \$25/lb depending on the style of the root
Sales are currently slow and no firm price has been established yet.
\$7.50/lb advance payment

Growers have maintained a cautious approach to selling. The advance payment program has allowed growers to hold root until prices are acceptable. Both the growers and the buyers appreciate this stability. Past examples of large growers selling below the cost of production to meet financial commitments left the industry unstable and vulnerable. Smaller growers were forced to sell at these low prices and buyers were faced with trying to unload large consignments and were forced to accept low prices in turn. Open communication between B.C. and Ontario has led to the understanding that the majority of growers will wait to sell until prices are suitable. This should lead to a longer than normal buying season, but a more stable price. These efforts have been initiated by the Ginseng Growers Association of Canada in Simcoe.

Restructuring of Canada's largest grower, Chi Na Ta (CNT), has lent stability to the market. They now have a reduced dependency on the bulk root market and have built strategic partnerships in China.

Crop Quality:

2000 yields are down 15-30% from that expected. There is a high incidence of Rusty Root and this downgrades the value. The diseases resulting from the cool wet season affected mostly 3's and 4's. Two-year-old gardens were slightly affected and seedlings appear to be unaffected. An accurate assessment cannot be made until all of these gardens are harvested.

The two diseases that remain of concern to the industry and that limit yield and quality are Rusty Root and Cylindrocarpon.

Diseases occurred in gardens where soil type was marginal for ginseng such as heavier, poorly drained soils. Gardens with low, wet areas suffered severe losses. Diseases were successfully controlled only where growers did not relax the spray program.

GREENHOUSE AND PROTECTED CROPS

Greenhouse Vegetables

Crop Conditions (S. Khosla, G. Ferguson and grower reports)

General Comments:

Weather: The early low light conditions slowed plant growth during late December/early January and delayed flower development. These conditions were followed by high light conditions, and the accompanying low relative humidity in the greenhouse caused the plants to flag. The summer was cooler than average with good light conditions. This allowed good plant development and production of good quality fruit.

Tomato

Production: The early plantings in November and December experienced good light conditions and were well established before the onset of low light conditions that affected the later planting. This delayed the early harvest by about 1 week. Fruit quality was varied but generally better than average. There was an increase in the area devoted to the cultivar Rapshodie and some large plantings of the cultivar Quest. The cooler summer reduced the degree of russetting and green shoulders, and maintained the firmness of the tomatoes.

There was a higher than normal acreage of fall crops in an attempt to capture the late market. The plants established well, and fruit development and plant growth were as expected. Fruit quality and size have been good. Overall production has been higher than the last year.

Tomato prices started normal, dipped below average but picked up well (especially in the fall) resulting in average to slightly above average seasonal prices.

Pest Management: There were no new arthropod pests during 2000 and only a few posed problems. A few operations had some problems with whiteflies but the majority was able to manage this pest with the parasitoids, *Encarsia formosa* and *Eretmocerus eremicus*. The tomato pinworm persisted from the preceding year and was detected in approximately 13 operations with an approximate total area of 112 acres or 45 ha. However, a combination of general awareness of the pest, use of monitoring traps, sanitation measures, and mating disruption prevented any outbreaks and serious losses from occurring. For the past few years and during 2000, the cabbage looper was a chronic pest through all of late spring, summer, and early fall.

With regard to diseases, there was some incidence of Botrytis and one operation reported a 13% loss of plants. Most operations were affected by powdery mildew but growers were able to manage this disease with currently available products. Bacterial canker affected quite a few operations and losses have been relatively significant in some operations. In most operations, however, implementation of sanitation measures kept losses to a minimum. A few unusually-occurring diseases, including pith necrosis (*Pseudomonas corrugata*), late blight (*Phytophthora infestans*) and viruses were also observed. Incidence of *Pseudomonas corrugata* was observed in one or two operations and losses were minimal. Late blight was detected in at least seven

operations with a total of 40 acres (16 ha). One operation reported a loss of 1kg/m² in 5ac or approximately 20,000 kg of fruit. Proper management of the environment was key to suppressing development of late blight in these crops.

Cucumber

Production: Cucumber crops established well in the early season but were delayed (2 weeks) due to poor light conditions. In the Leamington area this delayed production did not influence overall production, as the final yields were at normal or slightly higher levels. In the Niagara area, however, this lower light period was followed by several extended periods of low light resulting in slightly lower than expected production.

Fall planting was quick to establish due to good light and cool greenhouse temperatures. High production of good quality cucumbers was achieved.

Cucumber prices remained steady throughout the 2000-growing season with some periods of higher than average prices.

Pest Management: The acreage that used biological control during 2000 increased by 32% over that used in 1999. The total cucumber acreage estimated to be using biological control is 26%. Moderate weather conditions would have assisted in more successful control of thrips and spider mites generally. The most persistent pest was the cabbage looper and there is fear, like in other crops, that dependence on *Bacillus thuringiensis* (Bt) products (Dipel, Foray) will result in resistance. Some growers have complained of reduced effectiveness of Bt. Cucumber beetles were also reported in some crops and there is no adequate management recommendation for this pest. Aphids were more of a problem in some crops than others, being suspected of introducing viral diseases into such crops. One operation was seriously affected by Zucchini Yellow Mosaic Virus, losing approximately \$8,000 –10,000 worth of yield, and 2% of all plants. Another operation lost about 1% of its plants to Tobacco Ringspot Virus. Penicillium stem rot also affected approximately several operations and appears to be a perennial problem in such operations. Fusarium Wilt was also observed in about 3-4 operations for the first time, and losses from one operation were estimated to exceed \$100,000. Overall, the most common and problematic disease was powdery mildew and alternatives to current control products or more tolerant varieties are needed.

Pepper

Production: The early high light conditions allowed the pepper plants to establish well and build an efficient root system capable of sustaining the plant during the summer heat. This allowed good quality fruit to develop on well-balanced plants. Production has been reasonable but quality has been good.

Pepper prices started on an average price but dropped below average for 4 weeks in the summer. Fall prices were much higher but dropped late in the season.

Pest Management: All pepper crops used biological control agents to manage their insect and mite pests and continued to be successful in this regard. Aphids were prevalent from the outset and some crops suffered heavy infestations. Cabbage loopers were also commonly occurring, as in the other crops, and there was heavy dependence on Bt products. Use of the new predatory bug, *Podisus maculiventris*, was reported to assist in suppression of loopers in one operation. During spring and summer, Lygus bugs were more prevalent in some crops than others and caused considerable damage where their incidence was higher. Suitable controls are needed for this pest. The European Corn Borer (ECB) caused fruit damage in all operations but such losses were considered acceptable. Again, management of ECB depends on use of Bt and there is some use of light traps as well. A minor pest was the greenhouse whitefly and this pest occurs in most crops minimally every year. Incidence of the relatively new pest, *Echinothrips americanus*, was reported in only one operation and this poses a threat to pepper crops in the future. Currently available biological control agents do not provide adequate control for this pest.

Overall, the most serious disease problem was *Fusarium solani* which caused an estimated 25% of overall crop production in one crop. Last year, a 40% loss in crop production was reported in another operation. Some stem rot, caused by *Erwinia* sp also contributed to some plant loss. Tobacco etch virus, transmitted by aphids, contributed to about 35-40% yield loss in one operation. The heaviest losses during 2000 were caused by the thrips-transmitted Tomato spotted wilt virus. Losses in one 2-acre crop amounted to 100% because the plants were infected with the virus at an early stage of development, and this prevented harvesting of any marketable yield.

Mushrooms

Ontario continues to lead the nation in mushroom production with 48% of the total production. According to Statistics Canada, seventy three million pounds were sold in 1999, a decrease of 10 million pounds over 1998. Farm gate value was \$110 million, a decrease of \$10 million. Fresh market price was \$1.59/lb, an increase of 3 cents. Processing grade mushroom prices increased by one cent to \$0.89/lb. The drop in production may be attributed to a combined set of several factors: an intentional decrease in production to increase mushroom quality, a dry summer in 1999 which affected the compost's productivity and increased pressures from insects and disease. Some were puzzled as to the reported drop in production.

Total labor costs were 57 cents per pound of mushroom harvested, a increase one cent. Owners returned to the Ontario economy \$42 million in salaries and wages, employing 2056 full and part-time employees.

Mushroom production, in 2000, will be slightly greater with both the fresh mushroom and processing prices expected to be about the same as 1999.

Trichoderma harzianum, biotype Th4, (green mould disease) persists at a background level with occasionally restricted outbreaks, some with significant economic impact.

Problems with both dry bubble disease (*Verticillium fungicola*) and mushroom flies (*Lycoriella mali*) have varied from farm-to-farm with the seriousness of the problem varying from year-to-year.

Specialty mushrooms

The specialty mushroom industry is comprised of generally small growers, producing oyster and shiitake mushrooms. No formal production statistics are published in Canada. An educated guess would place the combined annual production of oyster and shiitake mushrooms in Ontario between 1 and 2 million pounds at a sales value of between \$4 and 8 million. Farmgate price has remained stable for several years. From the chairman's perspective, the specialty industry has overall remained rather stable for the past several years.

Competitor moulds (eg green moulds, bacterial blotch, *Penicillium* sp), and flies continue to be problematic in both oyster and shiitake operations.

GREENHOUSE FLORICULTURE

The Ontario floriculture sector remained strong during 2000 with continued market growth and steady prices of most crops. The growth of the export market has continued to grow at a rate of 10%. There have however been several bumps along the way this year, which will be noted later in the state of the Industry Report.

The market was strong for cut flowers particularly roses at Valentine's and remained strong throughout much of the summer and fall, times typically not strong cut flower markets. Snapdragons as a cut flower must be considered the renaissance crop. Although extremely popular in the 50's, the crop fell into complete disfavour in the 70's to only to be rediscovered in the mid 1990's. During the past three years expansion of production area for this crop has been greater than for all other cut flowers combined. Because of the sensitivity of the blooms to ethylene and the need to be shipped with the spikes upright has meant that the crop does not ship well over long distances. Rose production continues to decline locally as a result of the competitive pricing of imported roses. Many rose growers are shifting a portion of their production to alternate cut flower crops including Alstroemeria, Asiatic and Oriental lilies, Iris, Mutsomoto Asters, Lisianthus, Gerbera, Matthiola and Celosia, many of which are considered seasonal crops. However a number of these crops experience serious disease problems that are proving difficult to control. Seasonal production of sunflowers continues to expand.

The potted plant sector held steady prices throughout the winter and spring. Demand and price was strong for Easter lilies in part because fewer lilies were forced because of the late Easter. Cyclamen production continued to increase with more growers who focus on bedding plants moving into this crop for summer and autumn sales. Prices however, have been very low during the last quarter of 2000 because of the sheer volume of production. In addition, *Fusarium crown and root rot* continues to result in devastating losses, enhanced by the spread of the disease in closed recirculating subirrigation systems. Potted calla lily, a relatively new potted crop continues to be a difficult crop to produce because of the inability to control the spread of bacterial soft rot caused by *Erwinia carotovora* sp *carotovora*. Modest growth has occurred in other seasonal potted crops such as zygocactus, hydrangea and Rieger begonia. However zygocactus is another crop where *Fusarium oxysporum* can result in devastating losses. The potted poinsettia has become the primary potted crop associated with American Thanksgiving

and Christmas in North America. Production is relatively stable with over 7.5 million produced. Although growers do not consider it to be a very profitable crop, it is widely grown to maintain their work force and satisfy their customer base of mass market chains.

The bedding plant season particularly for sales to the south started with a "bang" very early (late April) because of the fine spring weather but quickly turned into an average or below average season for most growers. The cold, wet weather throughout Ontario and the whole US eastern seaboard discouraged homeowners from purchasing bedding plants and perennials. Orders were cancelled with the market quickly becoming glutted with over mature product resulting in falling prices. Fall pansy sales continue to grow but growers experienced serious losses due to *Rhizoctonia* and *Thielaviopsis*.

Many disease problems have plagued the industry this year. Bacterial wilt of geranium caused by *Xanthomonas campestris pelargonii* that originated in cuttings received from the breeders was a serious issue with several major propagators having to destroy their crops, cleanup and begin anew. This bacterial disease is of major concern because of the popularity of this crop in the home landscape. Poinsettia scab was introduced into Ontario for the first time on unrooted cuttings shipped from Central America.

The farm gate value of the Ontario production in 1990 was reported by Statistics Canada to be \$246 million. In 1999, the reported value was estimated at \$516 million, a 10% increase over the previous year. Ontario continues to represent slightly more than 50% of the total Canadian industry. The 1999, farm gate value as reported by Statistics Canada has more than doubled since the beginning of the decade with an annual growth rate of approximately 10%. Although industry representatives earlier this year were predicting this growth rate will continue well into the first decade of the new millennium, the sharp rise in natural gas prices during the last quarter of this year has tempered predictions.

Growth of exports continued with over \$240 million shipped to the US market in 1999 as reported by Industry and Trade figures. The industry experienced a net trade surplus of over \$70 million last year. Flowering potted plants and bedding plants continue to be the two major commodities being exported. Flowering potted plants and bedding plants are now being routinely shipped to destinations as far south as Texas and Florida and as far west as Illinois and Indiana. During the past two years the export market for cut flowers has been rapidly expanding as well, particularly into the surrounding Great Lakes states. However value added cut flower products such as mixed flower bunches and pre-made arrangements focusing on a theme or holiday are experiencing even stronger growth.

Large expansions of existing production facilities were initiated throughout 2000. Most of the expansion will be devoted to increased production of potted plants and bedding plants to meet the rapidly growing demand for product. In the cut flower sector, there has been modest expansion.

The industry has identified a number of issues that may impact on the future competitiveness and profitability of the floriculture industry. These include the following:

1. Much of the new production area has incorporated many of the latest technological advancements. During the past decade the Ontario greenhouse design/manufacturing/building firms have become world leaders in greenhouse structural design developing many innovative changes in terms of ventilation, and roof design. Growers have been incorporating some form of closed recirculating subirrigation system for most of the new area dedicated to flowering potted plant production. This new irrigation technology has created many problems related to the spread of root and crown rot fungal and bacterial pathogens.
2. The industry, particularly bedding plant growers and cut flower growers are expressing serious concern about their future given the direction the Ontario government concerning water and nutrient management. Most feel that current types of closed systems are not applicable to these because of the high cost relative of installation and maintenance, the low return per unit area of cut flowers and lack of suitability of current systems for these crops.
3. The industry continues to experience urban-rural conflicts. The success of the industry and the size of the new developments, particularly in Niagara has made it a very visible sector of agriculture. Issues dealing with fan noise, tractor trailer traffic, stray lighting, micro-climate influences on adjacent outdoor crops and concerns about prime tender fruit land being covered over with greenhouses are all issues with which individual growers and the industry as a whole must grapple. The region of Niagara has been studying the issue in response to concerns being raised by rural residents.
4. Many in the industry are concerned that USDA is using pest management issues, particularly quarantinable pests and diseases as non-tariff trade barriers making it difficult to export product on a timely basis. The use of the international CITES agreement on the movement and sale of native endangered species has created problems for growers shipping crops like Cyclamen, cacti and orchids because these species are listed. The commercial crops are all cultivated hybrids.
5. The industry sees the shortage of both skilled and unskilled labour as an increasingly important issue. This year many growers have found it difficult to source reliable labour as the economy strengthened. Accessing off-shore labour this past year has been beneficial for some.
6. Natural gas prices have increased by more than 40% since the spring of 2000. This is a major concern as fuel costs represent 20-30% of grower's total cost of production. This rise in energy costs may affect future growth and competitiveness of the industry. The floral industry is also concerned that rising fuel prices may force greenhouse vegetable growers across the province to shift into floral crops having a major impact on the volume of production in the market.

Flowering Potted Crops: The market has been strong throughout this past year including even this summer when temperatures and weather favoured people living outside and at the cottage. Zonal geraniums, flowering potted mums and poinsettias remain the biggest crops produced. Because many new cultivars are being introduced with interesting colour and form, pot mum demand continues to be strong. The strength of the poinsettia market is very important because of large number of growers who produce this crop and is the only potted crop of major importance because of its popularity for the biggest holiday seasons of the year, American Thanksgiving and Christmas. Profit margin remains small with this crop. Early sales of

poinsettias has been strong because of mild temperatures and the strong North American economy but softened as Christmas approached.

Profit margins in general, are narrowing for most flowering potted crops with growers achieving profitability through crop specialisation and volume production. All input costs including fuel, pots, labour and packaging/shipping have continued to increase while prices have remained relatively steady. Profitability of the industry has been maintained through crop/production efficiency, less crop diversification, economy of scale and use of technology.

Many other crops are in an expansion mode. Crops such as cyclamen, Rieger begonia, Kalanchoe, mini-roses and spring flowering bulbs continue to grow in volume produced and market popularity in part because many are no longer considered a specialty or holiday crop. Now, some that were only available for 4-6 weeks are now available year-round.

Fall garden mum production continues to grow rapidly as consumers wish to add fall colours to their gardens beginning in late summer. Unfortunately, pricing has become very competitive because of the large chains moving into this market. Growers are struggling to meet the early demand for product and are now being forced to grow a portion of their crop in smaller container sizes indoors where they are able to use a blackout system to initiate flowering. Plants grown in 10L containers outside during the summer continue to be the most popular in the market. However, this size is very expensive to ship and as such continues to be produced more for the local market. The smaller sized product is being directed toward the mass market as a way to create market segmentation.

Industry growth is primarily in response to sales of floral produce by the mass-market sector. The mass market, particularly many of the supermarkets, has dedicated floral departments and demand good quality, competitively priced floral products. However because most of the products are delivered centrally before being distributed a time delay occurs which too often results in loss of quality because of exposure to ethylene and remaining in an enclosed box for three to five days at room temperature. Growers must adopt production and distribution systems geared toward high volume shipping and offer the flexibility to change crops easily.

Weekly production of an increasing number of crops is occurring as consumer preferences and purchasing habits change. Weekly purchases of flowers are becoming more an integral part of the consumer psyche. In many ways the industry sees this as an advantage because growers are able to specialise in one or two crops and from the human resource and shipping perspective, the peaks and valleys are eliminated.

Cut Flowers: Cut flower prices have remained steady for the "bread and butter crops" such as chrysanthemums and roses even though input costs have risen dramatically. The production area has remained stable.

Demand for cut spray mums and roses improved again this past year. Renewed interest in spray mums has occurred as improved cultivars and colours have been introduced and their importance as a staple item in market bunches increased. Creating a demand for pre-made market bunches

using a variety of cut flowers and greens, both domestic and imported, has been a very important development because consumers enjoy the more informal nature of mixed flowers in a vase.

Cut mums continue to be grown in soil but changes in propagation and growing-on technologies have improved cropping efficiencies in the production areas. New European cultivars that mature more quickly and have good colour and form have been of benefit to the sector.

Rose growers during the '90's have rapidly switched the majority of their production from the soil to growing in coir (coconut fibre). In addition, they have changed their cutting and plant management practices that have improved the quality of roses produced so that they are better able to compete with the South American produced rose.

Production area for non-traditional cut flower crops continues to steadily expand. A modest increase in gerbera production has occurred this past year as growers either expanded their production areas or switched from another crop. Gerbera, both the regular and mini types, has become very popular but is not an easy crop to grow and the flowers are difficult to ship long distances.

Snapdragon, a cool season crop, is a renaissance crop that is now being widely grown by many smaller growers. This popular cut flower of the 1950's and '60's has made a dramatic resurgence in popularity during the '90's. Unfortunately for Ontario growers, some of the best performing winter cultivars for our light and daylength conditions are being withdrawn. There are no superior cultivars on the immediate horizon. Canada remains one of the major producers of this crop.

Many other cut flowers remain very steady in production and pricing including alstroemeria, Asiatic and Oriental lilies, freesia, iris and spring flowering bulb crops (tulips, daffodils).

There are many niche cut flowers that individual growers are very successful in growing and marketing, sometimes only during a certain season, including Limonium, Delphinium, Larkspur, "Gypsy" Dianthus, Lisianthus, Matsomato Asters, Stocks, Statice, Celosia, Astilbe and Sunflowers to name just a few. The most common grower complaint is that very little technical information on growing these crops is available.

Outdoor cut flower production for the fresh market as well as the dried is growing rapidly. It is an area that few in the floral industry have a good understanding of the size and scope of the sector. Outdoor production is very labour intensive, quality is strongly influenced by weather conditions and product prices low because it is grown outdoors. As a result, growers seldom remain focussed on this crop for any length of time because of the associated costs and uncertainties.

Bedding Plants: The market for annual bedding plants and perennials continued to grow although sales and prices were only average because of cold wet weather throughout the whole eastern North America through the normal selling period.

The production of bedding plants continues to increase faster than the production area because of a number of factors including changes in flat sizes and the utilisation of various sized plugs (individual seedling transplants). This past year many larger growers installed mechanical transplanters as a means of dealing with the labour and time crunches that always occur. However, the impact of all this is the need to have the tools to produce uniform, consistent seedlings. This requires high quality seed, proper production facilities, and a qualified growing team. However, the industry is dealing with biological entities not widgets that can result in considerable variation if informed decisions are not made.

There has been a flood of new and unique vegetatively propagated plant introduced to the Ontario market place from around the world that is ideal for growing in mixed hanging baskets, window boxes and patio planters. However, production costs have increased. Many growers are frustrated with the lack of production/management information for many of these plants that has required considerable effort on the part of growers to learn how to grow properly. This past year tobacco mosaic virus (TMV) was an issue in crops of vegetative petunias and related species.

Greenhouse production of perennials continues to grow but not as quickly as in the early '90's. However the market is demanding that the vast majority of product to be in bloom at shipping which is not presently possible while at the same time being compact. Greater knowledge on juvenility and environment manipulation is needed to control flowering of plants that are day length/light quality responsive. Label expansion of growth retardants to include perennials is needed.

A degree of market segregation for all bedding plants is occurring as growers attempt to differentiate product for the upscale garden centres from that of the mass markets. For example, many growers are growing a larger basket (12" VS 10") or a fibre basket for the upscale market with mixed plant material and the traditional 10" with a single plant species for the mass market.

The spring bedding plant market is still dominated by Impatiens, petunias, marigolds and zonal geraniums although their popularity may have peaked. The popularity and the selection of vegetative propagated annuals now available are making this segment of the spring market increasingly important. Demand for zonal geraniums continues to grow rapidly because of its strong garden performance.

LOW ACREAGE & SPECIAL CROPS

Low Acreage and Special Crops in the year 2000 were impacted by marketing limitations and weather conditions experienced throughout the growing season. Cool, wet weather during the spring and summer increased pest pressure significantly in most crops and delayed maturity. Growers and industry representatives reported an increase in disease pressure, difficulty in controlling weeds, nutrient, leaching, machine harvesting difficulties, post harvest storage and shelf life problems and ultimately market losses. Never the less those associated with production and processing of low acreage and special crops (niche crops) will continue to push for increased agronomic research, technology transfer, pest control and management despite the fact that crop insurance is unavailable and markets remain competitive. Those associated with Low Acreage

and Special Crops Researchers report similar results in research plots as those experienced by growers.

MUCK CROPS

The 2000 season at the Holland Marsh was wet and cool with reduced solar radiation, making it a particularly bad year for onions and carrots (except on highlands where they did well). As a result, some crops had to be reseeded and consequently were harvested late. Weed control was difficult, and some land was left empty because of timing and scheduling difficulties. Overall the weather was good during harvesting. Cold wet conditions limited thrips population, however pea leafminers are becoming a major pest, particularly on celery, and there were large losses this year. There are concerns about storage and soil-borne diseases, especially for carrots. The early season tended to have high incidence of soil-borne disease, particularly on root crops including corky root rot. There were few foliar diseases, but these were abundant later in the season. Nutrient management, uncertainty about the need for nutrient management planning, and the restrictions this will place on muck vegetable production is a major concern to growers.

Carrots: 2000 was a poor year for many growers, with losses up to 100%. Carrots tended to be short and there was a high level of culls, due to high soil moisture. There was a major presence of *Pythium* root rot, *Alternaria*, *Cercospora*, *Sclerotinia*, crown rot and bacterial soft rot. A drastic increase in carrot rust fly was noted this year. Research is ongoing to determine the levels of pathogenic fungi found on wooden pallet boxes and appropriate prevention/control measures.

Lettuce: Overall, the second half of the season was acceptable, but there were major losses in the first half. There was a greater presence of downy mildew this year as compared to most.

Onions: Several growers reported a total loss of their crop, while others reported a better year than expected. Thrips did not present a significant problem, although counts increased quickly with warmer weather at the end of season. Growers reported up to 70% white rot infection. Smut and damping-off were prominent. There are concerns regarding storage-related problems as some onions are already black inside, an indication of *Botrytis*. High incidence of downy mildew may be related to the lack of IPM programs - with downy mildew on carrots and lettuce at same time, it was hard to correctly time spray applications. Green onion growers are facing many challenges including the loss of all insecticides for onion maggots and weed control.

Celery: Early in the season celery did well, however later on there were great losses caused by high pea leafminer infestations.

IPM Updates

AIMS has established a non-profit crop scouting service for all Ontario fruit and vegetable growers. Their service and acreage scouted are expected to expand in 2001. Some growers use private consultants to regularly monitor their crops.

Research Reports

The following research reports were submitted. Copies of reports may be obtained directly from the authors, or from the Chairperson.

- a. Hallett RH. Efficacy of Citation, an insect growth regulator, and parathion to control pea leafminer on celery, 2000.
- b. Hoepting CA, MR McDonald and CD Scott-Dupree. Evaluation of fungicide and insecticide treatment combinations for the control of onion smut: field trial in the Holland Marsh, 2000.
- c. Hoepting CA, CD Scott-Dupree, G Dunn and MR McDonald. Evaluation of *Allium* products as germination stimulants for control of onion smut, greenhouse trials, in 2000.
- d. Hoepting CA, CD Scott-Dupree, and MR McDonald. Evaluation of insecticide and fungicide treatment combinations for the control of onion maggot: field trial in the Holland Marsh, 2000.
- e. Jaime M, T Hsiang and MR McDonald. The use of vesicular arbuscular mycorrhizae (VAM) for biological control of onion white rot (caused by *Sclerotium cepivorum* Berk).
- f. Kora C, MR McDonald and GJ Boland. Characterization of fungi colonizing wooden storage pallets used for carrot storage.
- g. MacIntyre-Allen JK, JH Tolman, B Dries and GA McFadden. Evaluation of planting water treatments for control of onion thrips attacking Spanish onion on mineral soil, 2000.
- h. McDonald MR and K V ander Kooi. Evaluation of film coating and furrow fungicide treatments for control of onion smut in combination with insecticide seed treatments, 2000.
- i. McDonald MR and K Vander Kooi. Evaluation of film coating for control of onion smut, greenhouse trials, 2000.
- j. McDonald MR and K Vander Kooi. Evaluation of film coating for control of onion smut and damping off in greenhouse trials, 2000.
- k. McDonald MR and K Vander Kooi. Field evaluation of Botran 75W drench for the control of onion white rot, 2000.
- l. McDonald MR and K Vander Kooi. Evaluation of Telone C-17 for the control of nematodes and *Pythium* root die back, 2000.
- m. McDonald MR, K Vander Kooi, and L Roberts. Field evaluation of Bremcast: a forecasting system for downy mildew of lettuce, 2000.
- n. McDonald MR, K Vander Kooi, S Westerveld and A Mckeown. Effect of nitrogen source on nutrient status and yield of onions grown on muck soils, 2000.
- o. Effect of field and post-harvest applications of *Trichoderma harzianum* on control of Sclerotinia rot of carrot in storage caused by *Sclerotinium sclerotiorum*, 1999.
- p. Effect of furrow and drench applications of *Trichoderma harzianum* on carrot root colonization and viability of sclerotia of *Sclerotinia sclerotiorum* in the field in 1999.
- q. Field evaluation of furrow and drench applications of *Trichoderma harzianum* for the control of cavity spot and yield enhancement on carrots, 1999.
- r. Progress of foliar infection on field grown carrots caused by *Sclerotinium sclerotiorum*, 1999.

- s. Epidemiology of the storage phase of Sclerotinia rot disease in carrots grown in organic soil, caused by *Sclerotinium sclerotiorum*, 1999.

In addition, a summary of research conducted at AAFC Horticultural Research & Development Centre, St Jean-sur-Richelieu, was presented by Dr. Gaetan Bourgeois. A recently published "Research Summary" is available from the centre or through the website: <http://res2.agr.ca/stjean/crdh.htm>.

NURSERY/LANDSCAPE & TURFGRASS

The nursery, landscape and turf industries in Ontario are comprised of the production and retailing of shrubs, trees, herbaceous plants and sod, and the maintenance of related landscapes and recreational areas.

In 1999, farm gate sales of nursery stock in Ontario totaled \$194,000,000, which accounts for 50% of national sales. This was an increase of about \$58,000,000 from sales in 1998. The land base devoted to this production was 16,700 ha, an increase of 11% from 1998. Sod sales were \$42,590,00 from 4,400 ha (a 30% increase in sales on a 2% decrease in land base from 1998). (*Nursery Trades Industry Statistics, Ontario and Canada, 1997-1999 - OMAFRA*). The value of related services in nursery, landscape and turf continue to grow. The industry survey project being developed by K. Nentwig has produced an estimate of as much as \$3.2 billion for the landscape and retail lawn and garden industry in Ontario, with additional unmeasured component of the nursery/landscape/turf industry (public sector parks and horticulture, the golf course industry, florist trade) adding substantially to the value-added total. This is on a farm gate of about \$236 million.

The 2000 growing season was characterized by another mild winter followed by an very early, but variable spring across Ontario. This was followed by very wet summer, in contrast to the previous two very dry years. The fall, in turn, was milder than normal, with warm temperatures, though rainfall returned to normal levels. Nursery growers and garden centres reported good sales in a long season.

While the return of normal to high rainfall meant no water supply problems or watering bans in 2000, there are ongoing concerns about water quality. Wet soils, drainage problems, and some increase in disease came along with the rain. Finding qualified labour to deal with increased demand continues to be a problem in these seasonal industries. The lawn care industry appears to have flattened out in terms of growth of opportunities or new operators.

The nursery and garden centre sector had a good year in 2000. The plum pox virus is causing some concern, particularly in Niagara. The pesticide issue (bans, loss of registrations, development of alternatives) continues to concern this sector. Availability of labour continues to be a problem particularly in the nursery, landscape, and lawn care sectors.

New sports fields and outdoor community recreational areas continue to be developed. There is ongoing concern that the specialized construction requirements for sports fields are often poorly

understood or ignored for budgetary reasons, leading to long term problems and even failure of new installations.

The sod industry, as a sector, was strong in 2000. High rainfall in some cases limited the ability to harvest quality sod from poorly drained soil. Demand was high, but sod supply was generally low.

The golf course sector had a good year in 2000, with significantly increased rounds because of the long season. New construction (new courses, renovation) continues to be strong in the golf industry.

Pesticide issues continue to be of concern in all sectors. This includes the potential for bans ("cosmetic" use?), loss of chemical registrations (e.g. organo-phosphate insecticides), and the need to develop low risk alternatives and/or adopt new tools through the minor use system.

The nursery, landscape and turf industry is confident and will continue to make a major contribution to the economy of the province in 2001.

POTATOES

Acreage and Varieties:

There are approximately 275 commercial growers in Ontario who grew about 43,800 acres of potatoes in 2000. The value of the crop is approximately \$62,000,000.

About 55% of the acreage is for the tablestock market and 45% for the processing market.

The main potato-production areas in the province are Alliston, Shelburne, Leamington, Ancaster, Simcoe-Scotland-Burford, Grand Bend and Mount Albert. Potato production is also located in northern areas such as Thunder Bay and Sudbury.

The main varieties grown for the fresh or tablestock market are Superior, Yukon Gold, Cherokee, Kennebec, Norland, Chieftain and Goldrush.

Due to processors' demands, the chipstock market has seen a turn around of varieties.

Snowden, which used to be the standard variety for potato chips, is now being replaced by proprietary Frito-Lay varieties. Monona, an old chipping variety with limited acreage in previous years, seems to be on the increase.

Shepody continues to be the main variety grown in the Shelburne area for the processing market, ie. for soups, stews and pre-peel sales.

Only 200 acres of GM potatoes were grown in Ontario this past season.

Ontario Potato Board.

In 1999, the Fresh and Processing Boards were amalgamated to form the Ontario Potato Board. Don Brubacher is the General Manager, Wayne Dorsey the Chairperson and Kevin Marcoux the Fieldman.

Seed Potato Industry in Ontario.

Although most Ontario seed-potato growers are members of the Ontario Potato Board, they continue to be represented by their own Association, the *Ontario Seed Potato Growers' Association* (OSPGA). In 2000, certified acreage was approximately 1000 acres. Seed sales to commercial growers were brisk with generally good field performance. The Association offers 30 different potato varieties to commercial growers and sales look promising for spring 2001, with the exception of GM potatoes. Frito Lay, the largest potato chip processor in Ontario, is granting more contracts for exclusive use of Frito Lay seed lines from their private seed company. A couple of Ontario seed growers are now increasing these FL lines for seed.

Production Problems in 2000.

This year's crop season generally started out early and dry in most areas. From the first week of May to the end of June some areas received almost perfect moisture levels, a large amount of acreage received 25 – 30 inches of rainfall in this period. Many acres were drowned out, replanted and drowned out again, with some not being planted at all. Many producers estimated crop losses ranging from 15% to 50%.. The Potato Board estimated that 5,000 acres of potatoes were lost in Ontario due to the widespread water damage.

PMRA granted the emergency registration of aerial spraying of Admire because the saturated soil of many fields impeded the use of ground sprayers to control the Colorado Potato beetle. Wireworms caused serious losses in many fields. There are no effective insecticides registered in Ontario to control this pest.

The wet weather favored the development of Late blight, Blackleg, Pink Rot and Rhizoctonia black scurf.

Without a doubt this has been the most expensive (from an input point of view) year to produce a crop of potatoes

The Integrated Pest Management Program:

A total of 20 scouts monitored approximately 13,000 acres of potatoes in Simcoe and Dufferin counties.. The scouts were trained by the OMAFRA Potato Specialist. The salary of the scouts was paid by the growers. In 1998, 1999 and 2000, the Rural Job Strategy Fund program provided some funding for the scouting program to the growers' associations to offset part of the cost of salaries. This year was particularly difficult to recruit students. In the Alliston area the Honda plants hires about 200 students each summer with salaries that are difficult to match. In the Shelburne area, the extremely wet weather delayed planting which in turn delayed field scouting. Hiring students at the end of June was a challenge.

SWEET CORN

The good news – Canadians eat 3.85 kg of sweet corn per person per year! Total vegetable consumption (fresh, canned and frozen) in 1999 was 88 kg per person (and rising!)

An unseasonably warm April had growers expecting another hot dry year! Early May brought welcome rains, which quickly became unwelcome as they continued throughout the rest of the season. Maintaining the sequential plantings was hard when the fields were wet more often than

they were dry. Many growers did not get all of their intended acreage planted. Other weather challenges included flooding in early July and hail in just about every region of the province.

The first harvest hit the market about July 5th, although there wasn't any real volume present until the 17th. Yields were lower than average and cool conditions resulted in slow growth and made the gaps in the harvest schedule even wider. Cob size was small all season!

Prices at the terminal ranged from \$12 to 20 per bag (5 dozen.) With the average price for the main season in the \$12 to 16 range. Roadside prices didn't seem to be any different than usual (as low as \$2 up to \$5 per dozen) with most stands sticking at \$3/dozen. Many consumers were less than pleased with the size of the cobs.

Stewart's Wilt was present on some of the early varieties and it appeared again at the tail end of the season. Few growers actually suffered economic losses due to it. Rust was definitely the pest of the year. Many growers had to go in with a fungicide. There are some concerns that the registered products are not effective under high levels of inoculum. Rust cause yield losses due to poor kernel fill as well as lost of marketability due to spores on the husks.

Pressure from the caterpillar pests was average. Timely control was often challenging due to the wet field conditions. Corn Earworm is becoming increasingly harder to control. It is arriving in Ontario earlier each year, and there is a lack of products registered that deliver good control.

The processors report that there were a few concerns regarding bees, but nowhere near the problems of last year. The Industry is working with the bee association to get the location of hives mapped location and to improve upon the current protocol.

Acreage under clear plastic mulch really hasn't changed, although there is frustration amongst growers as to the narrowing margin of returns on the mulched crop. Mulch disposal remains a key issue.

Bt sweet corn hybrids were grown by a few of the fresh market growers this year. They do not report any troubles marketing it, in fact the buyers at the terminal appear to appreciate the idea of decreased pesticide usage.

Fresh market sweet corn acreage (projected) for 2000 sat at 11,800 acres. This is down from last year's 13,300 acres. Projected processing acreage is 26,800, which is considerably lower than last year's 33,000 acres. In 1999 the Canadian farm gate value of sweet corn declined by 19% (the overall farm gate value of the vegetable industry declined by only 2.2%.) The decline in value of the Ontario crop was not nearly as strong.

TENDER FRUIT

The weather in Niagara, recorded at Vineland Station, was much different from the two previous years. The season started with a mild winter and an early spring, but then became a challenge. The winter was good for tender fruits, as the minimum temperature recorded was 15.6°C on

January 17 and 14.4°C on February 8. Total precipitation in January and February was 62.1 mm and 57.7 mm, respectively, about 10% more than the 80-year average. The fruit growing areas in Harrow and Simcoe were both colder, with Simcoe recording the coldest temperature of 23.3°C on January 22 and Harrow recording 19.8°C on January 25. Both Harrow and Simcoe were much drier than the winter average.

Moderate temperatures continued into March and April for all locations. Rainfall was well below normal in March but above normal in April, especially at Vineland which recorded 116 mm, well ahead of the 85 year normal of 70.6 mm.

Temperatures during May were warmer by 2.4°C compared to the 85 year average and 30% wetter. That led to an early blossom period for tender fruit, about 10-14 days ahead of normal.

The month of June turned out to be a key month recording 199.0 mm of rain, nearly three times greater than normal. July and August rainfall was very close to average although there was an extended dry period at the end of August and into early September. Rainfall recorded at Simcoe was 146.0 mm during the month of July. Temperatures during the growing season were moderate with only 1 day above 30°C for all areas.

The fall season was close to normal for temperatures. Precipitation during September was average but October rainfall was only 50% of the norm.

The weather for the 2000 season can be characterized as being wetter than normal for most tender fruit and grape growing areas but somewhat moderate in temperature.

The warm spring created some anxious moments as early blossoms were 10-14 days ahead of normal and subject to spring frosts. There were a few pockets that had some concern during this period, but there was minimal damage to peaches and other crops. Fruit trees came through the winter in good shape and with plenty of crop potential. There was a wide range of fruit set within the peninsula but most blocks required normal thinning to balance the crop.

Most crops did not need irrigation during July and August as the rain from June kept the ground moist for some time.

The early sweet cherry crop suffered a reduction in crop due to the above average amount of fruit splitting. The bulk of the crop, the Heidlefingen cultivar, had good fruit size and quality, and very clean requiring little grading. The Japanese and European plum blocks came up with good crops but had fewer fruits of premium size than expected. The sour cherry crop was lighter than the very heavy crop from the previous year but had good quality.

Peaches and nectarines had good crops and good fruit size during most of the season. The fresh market season came on quickly and in a condensed period which created pressure in the marketplace. The processing crop came in slightly higher than 1999 and was welcomed by the processors. Overall, pears were of good size and quality with crops being of near normal size based on preliminary estimates.

Disease pressure was high with brown rot on most crops. Bacterial spot was difficult to control on late processing peaches and created some concern for the processor.

Plum Pox Virus (PPV) was the major issue this season after it was detected at several farms in early summer. This created concern in many crops; peaches, plums, apricots and nectarines. To date, over 100,000 samples were tested by CFIA for PPV and over 11,000 trees removed as infected and buffered trees. Even though there was only 1% positives detected, the number of blocks and the number of growers was alarming. PPV has tested positive in most growing areas in the province except for Essex County and has even tested positive in Nova Scotia. This disease created a media frenzy and havoc in the marketplace. Many grower information sessions have been held to date, however, the Canadian Food Inspection Agency (CFIA) has delayed any major decision until later this winter. Quarantine zones, expansion of surveying and testing, nursery stock for growers, eradication versus management, questions on aphid transmission and financial assistance are just some of the key issues the industry must deal with next year.

2000 Ontario Tender Fruit Producers' Marketing Board Report

Fresh Market

Peaches: The 2000 peach crop marketed through the dealers totalled 1.42 million 6 x 3L's (22 pounds) compared to 1.53 million in 1999. Fruit matured almost one week later than in 1999 yet the season ended on about the same date. The compressed season resulted in higher receipts than had been estimated during the first half of the season. This, in turn resulted in greater market pressures and inventory backlogs. In response, the Board enhanced its market incentive program to encourage greater retail participation. For the most part, this move was received positively and the balance of the crop moved to market in an orderly manner.

Nectarines: continued to show an increase in production and volume marketed in response to consumer demands.

Plums and Prunes: The 2000 Yellow Plum crop was down 22% from 1999. The crop moved to market in an orderly manner at slightly higher prices. The blue plum crop is decreasing as black knot continues to take its toll on tree numbers. One major Quebec retailer discontinued purchasing blue plums from Ontario due to our inability to consistently deliver the variety and quality of plums they require.

Pears: There was a full crop of Clapp, Bartlett and Bosc pears. Fruit size was much improved over 1999 as a result of ample rainfall. Bartletts were affected by russetting to a much greater degree than normal. This combined with the high quality of the U.S. pears, which were sold at very competitive prices, resulted in a sharp reduction in the volume of Ontario Bartletts sold on the fresh market. Fortunately, Nabisco was able to receive the additional volume.

The Bosc pear crop was larger than normal with good fruit size and high quality. Regardless, movement has been slower than normal as retailers continue to market U.S. Bartletts at attractive prices. The 2 3/8" size category is quickly falling out of favour with Ontario retailers.

Tender Fruit Processing

Sweet Cherries: Although the sweet cherry crop was below 1999 levels, the volume sold for processing increased to 450 tons from 392 tons as a result of rain splitting, which rendered the fruit unmarketable for fresh market. Fortunately, this fruit was suitable for brining purposes.

Sour Cherries: The 2000 crop at 5988 tons was down 26% from the very large crop harvested in 1999 but 7% greater than the five-year average. Sales of Chilled Pitted Sour Cherries remained unchanged at roughly 40,000 11-lb. Pails. The remainder of the crop was purchased for institutional sales.

The U.S. had a very large carry over from the 1999 pack. This coupled with the U.S. crop coming in some 40 million pounds over estimate has resulted in a very large inventory in that country. 47% of the U.S. pack was set aside in reserve pools for release as soon as the unrestricted volume has been marketed. Four major Ontario processors have become members of CherrCo. CherrCo is an U.S. grower/processor cooperative and markets between 75 and 80% of the U.S. volume of frozen sour cherries. CherrCo along with the U.S. Cherry Marketing Order is credited with stabilizing the marketing of the U.S. cherry crop for the benefit of both growers and processors.

Clingstone Peaches: The old adage, "beauty is only skin deep" was never so true as it is with clingstone peaches. Plum pox did have cosmetic affects on the skin of the fruit but had no adverse affect on the quality of the finished pack. Processors received 7872 tons of clingstone peaches in 2000. Local supplies were supplemented by imports from the U.S. and from Greece.

There was a high incidence of bacterial spot this season. Nabisco accepted and paid full price for peaches affected by up to 5% bacterial spot. In addition, Nabisco was able to purchase 751 tons of peaches, which were affected by more than 5% bacterial spot and paid \$365 per ton for these peaches. Approximately 500 tons of mainly Babygold 5's were lost due to severe bacterial spot.

Nabisco has been encouraging clingstone peach production outside the Niagara Peninsula. These efforts were being well received and resulted in higher than normal orders for clingstone peach trees for planting in 2001 and beyond. These efforts have now been frustrated by the plum pox situation, which has resulted in a quarantine of all nursery stock produced in Niagara. Further, the quarantine remains in effect from U.S. sources as well. Although the Board and the Plum Pox Task Force has made recommendations on this issue, at time of writing this report, CFIA has yet to respond.

Processing Pears: At 5609 tons, the processing pear volume was 35% greater than 1999 and 45% greater than the five-year average. Here too, imports from the U.S. supplemented Ontario processor requirements.

2000 Nabisco St. Davids Report

As with the '99 and '98 season, the clingstone peach and pear crops of Niagara had an early start to the season, with bloom dates comparable to that of 1999. Crop heat units to August 1st were 2,116 compared to our 30-year average of 2,121 CHU's. Despite the cooler temperatures in the summer months, the 2000 tree fruit season remained early throughout the harvest season. The first day of local peach delivery (Vulcan) was July 26th, compared to our normal date of August 2nd. Peak harvest dates of Veecling, Babygold 5 and Babygold 7 were August 14th, August 30th and September 5th, respectively. This was approximately 7 days earlier than 'normal', and very similar to 1999. However, more than any other single factor, precipitation in April, May and June set the tone for agriculture throughout the province for the remainder of the season. Combined, these three months resulted in 181% of normal rainfall (based on data from the Niagara Weather Services stationed at the Niagara Regional Airport).

The 2000 processing pack season presented itself with new challenges and rewards throughout the season. A brief overview of this year's experiences is as follows:

Record fresh cling tonnage processed: 106% of '99 and 124% of our 5-year average.

- Sales continue at double-digit annual increases, particularly for 5 oz. fruit cup products. The rollout of 'Mandarin Magic' in January 2000 resulted in sales beyond original projections. Additional new flavoured fruit products will continue to place added need for increased local tonnage. Over 125 million cans have been packed at St. Davids in 2000.
- Completed 1st phase of planned 4-year building expansion/replacement program. Capital projects equaled \$4.2 million (2.2 times greater than our 4-year average).
- Record grower bookings for 2001 cling nursery stock, both within and outside of the Niagara region. Ontario growers have requested over 43,000 trees - more than double our maintenance level. This level of new plantings must be sustained for the next 5 years to meet our current production requirements for the year 2010 and beyond.
- Interest for pear plantings from traditional apple producers is increasing. This opportunity is being limited by the availability of nursery stock.
- We experienced unfavourable raw product recovery and plant throughput throughout the season with cling peaches. This was attributed to various issues, including new equipment installations delaying an efficient startup that resulted in long-term storage throughout the season, bacterial spot from local Babygold 5's, and soft, small fruit from early season California purchases.
- Considerable pressure for cold storage space throughout September due to lower than planned plant throughput - peaking at 3,800 tons in storage. However, we experienced minimal decay losses, considering the volume that was at risk.
- Received and successfully processed bacterial spot scarred peaches. Over 700 tons of Babygold 5's were at risk of being lost.
- Completed 2nd year study, conducted by Univ. of Guelph, Vineland, on "field run pear pricing schedule".
- Commercial canned quality trial for HW-620 was not successful - dark, grayish fruit colour.
- Obtaining suitable seasonal labour for the processing plant was a challenge throughout the pack.
- The holding quality of Bartlett pears was below normal levels due to the wet spring. Reduced sugar levels and mixed pear maturity was typical throughout our processing season.

- Pear pack expected to be completed on December 5th.
- Uncertainty resulting from plum pox virus situation (a repeat statement from our '99 report – but now it's an 'understatement').
- The early stages of our Kraft takeover have commenced. Announced in August, the Nabisco sale is part of the worldwide trend towards consolidation of the food industry. With the Nabisco integration, Kraft will be competing with Nestle as the largest food company in the world.

Raw Product Summary:

Product	Source	Tons processed			% of '98/'99 Average
		1998	1999	2000	
Cling Peaches	Domestic	6223	6985	7405	112%
	Imports	<u>3,241</u>	<u>5,393</u>	<u>5,697</u>	<u>132%</u>
	Total	9,464	12,377	13,102	120%
Processing Pears	Domestic	3,066	3728	5,178	152%
	Imports	<u>6,366</u>	<u>9,277</u>	<u>6,666</u>	<u>85%</u>
	Total	9,432	13,005	11,844	106%
Total Raw	Domestic	9,289	10,713	12,583	126%
	Imports	<u>9,607</u>	<u>14,670</u>	<u>12,363</u>	<u>102%</u>
	Total	18,896	25,382	24,946	113%

TOMATOES

The main concerns for the 2000 crop year were excessive rainfall, flooding in some areas and diseases, particularly bacterial diseases, which resulted in decreased yields. Herbicide injury and late blight were also a problem in some fields. Control of bacterial diseases in plant growing greenhouses and on plug transplants is an ongoing concern. Clean seed and clean transplants are essential to the industry. Cooperation from the seed companies and greenhouse plant growers is required.

The combined farm value for both processing and fresh market tomatoes in Ontario for 1999 was \$68,686,000. This represents a decrease of approximately 1.6% from the 1998 value of \$69,807,000.

a) Processing Tomatoes

For the second year in a row, the yield of processing tomatoes has decreased due to unfavourable weather conditions and disease problems in 2000. The 2000 yield (28.4 tons/ac) was approx. 11% below the 1999 yield and 23% below the record 1998 yield but only slightly below the 10 year average yield of 29.4 tons/ac. The processed tonnage was approximately 16% below the contracted tonnage in 2000.

Table 1. Recent trends in the Processing tomato industry in Ontario: (Sources: O.P.V.G., OMAFRA Publication 20 and OMAFRA website)

Year	Contracts	Measured Acres	Processed Tonnage*	Avg. Yield (tons/ac)	Gross Farm Value
1991	264	20,680	450,000	21.8	\$52,502,000
1992	289	17,270	420,000	24.2	\$43,492,000
1993	275	19,206	510,000	26.5	\$53,040,000
1994	237	19,834	575,000	28.9	\$59,336,000
1995	228	18,578	578,000	31.0	\$60,619,000
1996	222	15,940	502,000	31.2	\$52,475,000
1997	192	14,800	497,000	33.3	\$50,310,000
1998	183	15,060	562,000	37.0	\$58,941,000
1999	187	16,866	545,000	32.0	\$57,286,000
2000	173	15,818	455,000p	28.4p	N/A

* includes fresh market acreage.

b) Fresh Market Tomatoes

The yield of fresh market tomatoes was estimated to be 30 to 50% below normal due to frost, wind, hail, flooding and disease. Planting schedules were disrupted due to torrential rains. Fruit quality was hard to maintain. Market prices were similar to previous years but input costs were higher (particularly fuel and cost of fungicides plus application). Greenhouse tomatoes packed and sold as field tomatoes hurt some growers who were unable to compete with the lower "cleanup" prices offered by greenhouse tomato vendors early in the season.

Table 2. Recent trends in the Fresh Market tomato industry in Ontario: (Source: OMAFRA Publication 20 and OMAFRA website)

Year	Harvested Acres	Farm Value
1991	5,597	\$23,215,000
1992	7,500	\$32,055,000
1993	5,910	\$43,633,000
1994	6,308	\$36,705,000
1995	5,217	\$26,454,000

1996	5,714	\$22,603,000
1997	5,500	\$19,800,000
1998	2,325	\$10,866,000
1999	2,200	\$11,400,000
2000	2,800 (p)	N/A

EMERGING ISSUES

AGROFORESTRY

Maple Industry Syrup:

At the present time, there is a significant surplus of maple syrup in the province of Quebec. This is partially due to substantial growth in the Quebec industry in recent years and also because of a bumper crop in parts of Quebec in 2000. As a result, the price for bulk syrup is depressed and there is more incentive for importation of Quebec syrup into Ontario. This situation has the potential to affect the profit margin of producers in Ontario who have a significant proportion of bulk sales or those who purchase syrup in bulk for re-packaging. Quebec intervention into retail and market sales in eastern Ontario might make it more challenging for local producers to market their maple products.

There is a growing need to develop a mechanism within the maple industry, which will enhance industry contributions to maple research. At the present time, the North American Maple Syrup Council is providing excellent support to seed research projects anchored in Ontario. However, the organized industry in Ontario is having a challenging time financing basic program needs and contributions to research activity are often necessarily of the in-kind variety. A mechanism needs to be developed to ensure that Ontario's contribution to maple research activity is continued and enhanced. North American Maple Syrup Council representatives are looking to Ontario to help develop creative solutions to this problem.

As with many other agricultural commodities, production costs continue to rise (e.g. fuel costs) yet the price of maple syrup has changed very little in recent years. While a detailed economic analysis has not been done, anecdotal evidence suggests that more maple producers need to consider a focus on value-added production. It is obvious that Ontario maple producers and the Ontario maple industry as a whole would benefit from specialist assistance with a focus on market development and value-added.

Since the ice storm of 1998, maple producers appear to be satisfied with the assistance provided. However, due to largely institutional constraints on existing programs, assistance allowed for inter Federal Disaster Relief Policy is short-term (e.g. three year implementation plan). This assistance and time-line for implementation of projects does not adequately address needed support for applied research. The Ontario Maple Syrup Producers Association recognized this when they presented a brief to the government outlining needs shortly after the storm. Some aspects of the research work (e.g. effects of the storm on productivity, tree nutrition and fertilization work etc.) simply must be carried out over a longer period of time to produce conclusive results. Otherwise, maple producers in eastern Ontario may suffer from lack of technical guidance.

The Asian-Long Horned Beetle remains a concern of maple producers in Ontario. Fortunately, no sightings of this insect have been confirmed in Ontario. Continued surveillance for this pest by government, industry and the general public is very important.

Christmas Tree Growers:

There are a limited number of herbicides and insecticides available for use in christmas tree plantations. This places Ontario growers at a competitive disadvantage to American growers who have more approved pesticides at their disposal.

The Pine Shoot beetle has restricted the movement of exports in recent years. Christmas tree growers may need assistance to deal with this issue in the future.

Agriculture:

Environmental Farm Plan Program

This highly successful program may be terminated because of lack of funding. It is essential that government funding be made available to ensure the continuation and expansion of this very worthwhile program.

Wildlife Impact on Ontario Agriculture

In recent years more attention has been paid to the many positive values of wildlife in rural areas. Unfortunately, some species of wildlife cause very serious economic losses to farmers and there is no coordinated strategy for control of damaging species.

The Ontario Soil and Crop Improvement Association recently conducted a study on behalf of the Ontario Agricultural Commodity Council to investigate the economic impacts of wildlife on agriculture on a sector-by-sector basis. A report summarizing the findings is now available from OSCIA. OSCIA hopes to garner necessary support from farm organizations, governments, and wildlife conservation groups to launch practical initiatives, which reconcile habitat issues of valued species, with those associated with nuisance wildlife. The nuisance wildlife problem must be recognized and appropriately addressed, and not lost in more popular initiatives that aim to create more habitats in the farm landscape.

Retirement of Fragile Lands on Farms

While the benefits of retiring fragile lands are well known, there is currently no provincial-scale fragile land retirement program that builds on the strengths and success of the federally funded permanent cover programs offered in the early nineties. Without a more concerted effort to retire fragile lands, soil erosion and nutrient management problems may be more severe in the future.

Woodlands:

a) Liquidation and High-Grading

With increasing stumpage prices in recent years, problems with indiscriminate harvesting of valuable woodlands continue and have been accentuated. Incentive programs, which are designed to encourage proper forestry practice and by-laws designed to regulate harvesting where they exist, fall short of solving this problem. Unfortunately, woodlots are often viewed as bank accounts without a long-term planning horizon. The high exchange rate between Canada and the US is placing extreme pressure on Ontario's best quality hardwood resource, especially throughout southwestern Ontario.

Sometimes developers will claim forest clearing for agriculture initially and once the land is cleared will apply for permission to proceed with development.

Innovative planning strategies are needed to help mitigate the liquidation and high-grading problem.

b) *Taxation*

There is some concern that farmers receive an unfair advantage over other woodlot owners with respect to Provincial Tax Incentive programs. While requiring a minimum level of income from the whole farm, farmers are not required to prepare a management plan in order to qualify for assistance under the Farm Tax Incentive Program. At the same time, the cost of plan preparation and plan approvals is not always offset by the property tax reduction for non-farmers potentially interested in the Managed Forest Tax Incentive Program.

There is continued confusion and misinterpretation over Income Tax bulletins IT 373R2, and the use of income versus capital for forestry expenses, by farm and non-farm woodlot owners.

c) *Forest Certification*

Woodlot certification through the Forest Stewardship Council is being investigated by the Eastern Ontario Model Forest through the implementation of a Pilot Project in eastern Ontario. If successful, this initiative could impact forest management practices in the future.

d) *Private Land Forest Resource Information*

The Ontario government does not have updated information on the nature and extent of private land forests and is not in a position to determine the sustainable use level for the resource. There is a need for better statistics on wood volumes harvested annually, tree planting numbers, value-added and employment figures, percentage of farm income from wood products, etc.

General:

It is becoming apparent that there is a growing need for closer coordination in the design and delivery of forestry and agroforestry programs. It is expected that the need for closer integration of policies and activities will become more acute over the next few years.

There is also a growing need to design sustainable support funding for high priority agroforestry research and programs.

APICULTURE & POLLINATION

1. Terramycin Resistant American Foulbrood. American Foulbrood (AFB) is a highly contagious bacterial disease of honey bee larvae. It kills bee larvae after spinning their cocoon. Infected larvae will dry down to a hard scale that contains millions of spores. Spores are very resistant to heat and chemical disinfections. Infection with AFB occurs at any time of the year when brood is present and invariably kills bee colonies. As bees rob dead infected colonies, AFB infections spread into other bee colonies in the same apiary or surrounding apiaries and more colonies will be killed. Annually 1-3% of bee colonies are reported to be infected with this

disease in Ontario.

To control AFB, beekeepers use Terramycin as a preventative method to reduce the rate of infection. Continuous use of a single antibiotic (Terramycin) for over 40 years has resulted in development of resistance by the AFB bacteria. In Alberta, British Columbia, and more than 21 states in the USA, AFB resistant to Terramycin has been found. This has created an immediate need for another antibiotic to treat colonies for AFB. Development of a long term strategy for controlling AFB is needed to protect bee colonies, to reduce drug use in bee colonies, and to produce residue free bee products. This strategy can be based on the use of hygienic honey bees which are genetically resistant to AFB, sterilization of hive parts, burning of infected colonies and use of management techniques to reduce the risk of spreading AFB to bee colonies.

2. Residues in Hive Products. In recent years beekeepers around the world have had to use miticides and antibiotics to treat parasitic mites and other bacterial diseases in bee colonies. The continuous use of these drugs has increased the risk of contaminating hive products with residues. Importing materials such as wax foundation from the USA and other countries can lead to introducing contaminants to bee products. In Ontario beekeepers have been applying an integrated pest management program for controlling the parasitic mites. This reduces the reliance on miticides and reduces the risk of contaminating bee products. Continuing the development of the IPM program and extending it to cover the other pests and diseases has become very important to the beekeeping industry. Development of a continuous monitoring system to check hive products for residues will enable the industry to produce quality products that meet the expectation of consumers.

APPLES

Health and Vitality of the Industry

The Ontario apple industry annually contributes one third of a billion dollars to the economy of Ontario. Apples are the favorite fruit of Ontario consumers and are the greatest profit generator of all fruits in the produce section of supermarkets. Canadians as a whole have a higher per capita consumption of apples than do Americans.

Apples move freely across our borders and Canadians enjoy fruit from a large number of other apple-producing areas. Intensive growing districts in South Africa, Chile, New Zealand and the State of Washington in the U.S. rely heavily on exporting and this fact impacts heavily on our producers.

At this time the apple industry is going through a period of economic woes. There is overproduction in intensive apple growing areas. A large number of other fruits compete for the consumer's dollar. The dumping of Chinese concentrate into North America has done much to depress prices across the industry. Apple producers have been subjected to a cost-price squeeze for over a decade now and the problems this generates have become acute.

Ontario apple growers saw this squeeze looming a decade or more ago and took appropriate action to alleviate it as much as possible. Considering the obstacles growers have done well to react to market and society demands. They accepted and made changes to their production units

and practices and are now able to produce to world class export standards. These changes did not come quickly and inexpensively.

Ontario apple growers now sell three times more count size fruit than a decade ago. They are replanting orchards to new varieties on dwarfing, high density systems. They have significantly lowered the percentage of fruit that goes to the juice factory. They can and need to do better, as there are still a large number of old trees in the ground producing low quality fruit.

Producers are still frustrated by economic hardship. Subsidization of growers in other areas and downloading of services by Federal and Provincial governments keep them in a non-competitive position. If action is not taken to alleviate their financial position they will not be able to continue to compete in this unfair situation.

The Ontario apple industry has submitted the Re-Start 2000 Proposal, to improve the health of this rural based industry and the associated rural infrastructure, to OMAFRA but, to date, this program has not been supported by the Minister.

Loss of Provincial Apple Specialist Position

Over the past 5 years there has been a significant reduction in OMAFRA extension support services at the grower level. With the retirement of the Provincial Apple Specialist in 2001 it is feared that this position will not be filled with a front line replacement. The apple industry believes that the loss of this critical position at this time is unacceptable. The "new" discipline-oriented positions within OMAFRA are not seen as having the "front line" experience or partnership-based relationship the industry shares (and needs) with the Provincial Apple and Apple IPM Specialists. The industry is constantly changing and requires dedicated, unbiased technical support, from individuals who are sensitive and learned in regards to the industry's needs and goals at the field level, and who can competently support the industry.

Withholding of Research Funding

Funding for the Ontario Apple Marketing Commission's Healthy Futures project application, entitled "Project TRIAD: Tree to Retailer Innovative Apple Development" was put on hold for all of the year 2000. Several major research, development and marketing initiatives for the Ontario apple industry have been put on hold or delayed because of this decision. Ontario Apple Marketing Commission research funds have been set aside to be used as "money on the table" for these research projects. The OAMC has been frustrated by the fact that if this money is allocated before the Healthy Futures proposal is approved it can not be matched. This delay in funding approval ignores the needs of this industry and the seasonal nature of horticultural research and development. It is suspected that this holdup in funding is related to the expected producer vote in 2001 on the future of the OAMC. Apple trees and apple producers will not be voted out of existence regardless of the outcome of that vote nor will the research, development and marketing needs of the industry.

Withdrawal of OMAFRA Commitment to IPM

The Ontario apple industry has long been regarded as a leader in IPM acceptance and adoption in North America. Apple growers are well versed in IPM due to their commitment to attending workshops, schools, demonstration projects, Environmental Farm Plan workshops and their close working relationship with OMAFRA regional extension staff and the provincial IPM Specialist. Various grower-funded monitoring programs across the province have resulted in more than 40%

of the total apple acreage being under IPM practices. This has resulted in significant pesticide use reduction, sound management of pesticide resistance, and reductions in environmental impacts of pesticides.

The loss of OMAFRA Regional Specialists will have a significantly negative impact on the industry in terms of both delivery and development of IPM programs. The industry fears that without the confidence of having expert and unbiased advice of OMAFRA staff the system will revert to a more pesticide intensive one. The industry does not see AIMS as a delivery replacement for OMAFRA staff, as the information generated by this organization is based only on centralized scouting and general agriphone information and not site specific information. Pest management practices will revert to chemical company based recommendations based on narrow product lines. Pest/beneficial balances will alter as a result. Benefits obtained to date will be quickly lost. Growers, the environment, and consumers will lose. This very scenario has happened in other countries, e.g. Great Britain.

The loss of Regional Specialists will also have a negative impact on development oriented projects conducted by the provincial Pome Fruit IPM Specialist, who relied on the Regional Specialists to assist in finding grower demonstration sites, provide local pest problem updates and assist in efficacy trials.

OMAFRA has been pivotal in the development and establishment of integrated pest management in this industry and in this province. Ongoing, unbiased technical input from front line extensionists is critical to the ongoing success and positive economic and environmental benefits of this technology. With renewed focus on pesticide reduction, groundwater impacts, food safety, interest in eco-labeling marketing programs and pesticide resistance management the reduction/withdrawal of OMAFRA services is shortsighted and counterproductive.

Need for Self-Directed Risk Management Strategy

With the level of support that current governments in Canada and Ontario are willing to direct towards agriculture it is imperative that the best possible safety net programs be made available to producers.

One of the policy areas funded by the government that is included in the safety net envelope is crop insurance. The apple producers of Ontario as well as most of the other horticultural producers have a long history of lack of coverage and general dissatisfaction with crop insurance. Alternatives have been looked at extensively, with government support. The industry feels that a Self Directed Risk Management Plan (SDRM) best meets the needs of our industry and has been actively pursuing it since 1992. A "Pilot" project that has been labeled SDRM has been available to some horticultural producers including apples since 1996.

SDRM has been the subject of a number of government studies and the following are a few of their findings:

1. "SDRM did a better job of reducing net income fluctuations as a percent of average income", compared to crop insurance
2. Although SDRM and crop insurance both increased the average net income of growers, SDRM increased it substantially (over 13%) more.

3. The cost to provide SDRM to 85% of Ontario's apple growers and close to 90% of the acreage would be similar to what is currently being paid to insure about 30% of the growers and close to 50% of the province's apple acreage.
4. It is a program that is very easy to administer and eliminates inconsistencies in delivery. The Ontario apple industry needs a stand alone, equitably funded Self Directed Risk Management program, for apples (and the rest of horticulture), to be an integral part of the National Safety Net Program.

BERRY CROPS

1. Availability and Quality of Water for Berry Crop Production

Adequate, good quality water is necessary to maintain berry crops. Even in a wet year, water is still necessary for frost control and pesticide application. Consistent water quality is essential in light of food safety and consumer concerns. Reliable, inexpensive, on-farm testing systems are required to monitor water quality throughout the growing season. Information is required on practical methods to treat water for safe crop use.

2. Nutrient Management

In light of the Nutrient Management Plans which will be developed for all crops in Ontario, it is essential that the macro- and micro-nutrient recommendations for strawberries in Ontario be evaluated. This has been a research recommendation of this committee for many years. However, there has not been a researcher to address this issue in the past. A researcher may now be available, provided competitive research funding is available for nutrient management research in horticultural crops.

3. Food Safety

Food safety continues to be an issue both for growers and consumers. As they are often eaten fresh and due to past incidents of contaminated imported berries, berry crops are particularly prone to the consumers' perception of food safety. Much progress in grower education has been made in the past year, however OMAFRA extension staff must continue to educate growers on food safety issues and the practices needed to avoid potential problems. Particular concerns at this time are practical methods to test surface water for contamination and methods to ensure water safety for berry crops.

4. Pesticide Registration

Some progress seems to have been made in the last year towards harmonization of pesticide registration between the US and Canada. However, many pesticides continue to be registered first in the US for a wide range of horticultural and other crops, and then in Canada, at a later date, for a smaller range of crops. True pesticide joint reviews and harmonization of registration is necessary so that Canadian horticultural producers do not continue to fall behind their American counterparts. Improvements need to be made to the OASCC system to facilitate coordination with the US IR4 program. A strong OMAFRA minor use coordinator is needed to direct Ontario's minor use program.

5. Accessibility of Unbiased Information and Field Extension Services

OMAFRA field extension services have been reduced drastically as OMAFRA's mandate has shifted from field service to program development. In some commodities, private industry has filled the gap left in the field. The infrastructure required for a network of unbiased, privately funded resources is not in place for the Ontario berry industry. Consultants and industry are servicing only a small percentage of the growers. Unbiased information, advice and recommendations from experienced credible sources is required and should be more widely available.

6. Shortage of Reliable Labor

Labor was adequate for the 2000 season only because yields were down significantly. A reliable supply of labor is a consistent issue in most berry growing areas. This problem is due, in part, to the change from PYO to ready picked requiring more labor than in the past. There has also been a shift from agricultural summer jobs to the service industry jobs in many areas. The lack of reliable harvest help is a major factor in limiting the size of berry plantings in Ontario.

7. Continuing Funding for Use of New Technologies in Research Programs

Research funds are spent to develop new technologies, for example PCR, but these techniques are not adopted in our research programs due to lack of funding and expertise. For example, within the breeding program screening for susceptibility to verticillium wilt and leaf scorch in strawberries and for aphid resistance in raspberries would help breeders release new cultivars with some resistance to these problems. However, continuing funding is not available to establish these programs.

CRUCIFER CROPS

1. Concern was expressed about the impact of nutrient management plans on crucifer crops.
2. "Swede midge" was identified this season and has become a significant problem for growers in the York, Durham and Northumberland regions.

GINSENG

1. Cylindrocarpon root rot is appearing with increasing frequency in gardens. Some gardens have experienced losses in the range of 50% and occasionally as high as 90%.
2. The incidence of Rusty Root is increasing. Loss of quality has forced some growers to accept prices below the cost of production. Losses due to Rusty Root can be as high as 75%.
3. Lack of disease control in some gardens has raised the issue of emerging resistance to the fungicide Ridomil. Ridomil is one of 2 products used in tandem for the control of Phytophthora root rot. Ridomil resistance, if widespread, could lead to serious losses.
4. In order to access the North American/European market as a medicinal plant, ginseng must undergo research supporting any health claims that will be made. These trials are expensive and are primarily supported by grower dollars. Growers are not well equipped to evaluate either the significance of medicinal research or the scientific methods used by the researcher.

GREENHOUSE AND PROTECTED CROPS

Greenhouse Vegetables

1. *Energy costs* – Energy conservation, use of thermal curtains.
2. *Environment* – Minimize waste from greenhouse industry; plastics, nutrients, rockwool, etc, have to be addressed. Larger sizes of greenhouses have greater impact on environment; for nutrients, collection systems have been installed and re-cycling in on the increase
3. *Labour* – Due to change in production cycle, we need to develop techniques to allay pressures on labour requirement. Also, measures are needed to improve labour, e.g. improve payscale.
4. *Food Safety* – Chemical residues to be included as part of it. Need to include peppers as well.
5. *Marketing* – quality is an issue. Quest is easier to sell; Rapsodie performs well, but can fail in summer; some PMT cvs have good qualities, others not. Pilot to look at quality by OGVG
6. *Pepino Mosaic Virus* – presence indicated in Ontario

Mushrooms

Commercial Mushrooms

The major concerns are:

- 1) environmental issues which include odors generated from the composting process and nutrient management, especially in the management of waste water
- 2) shortage of farm labor and
- 3) rising costs of production associated with the energy costs of production and transportation of goods.

Specialty Mushrooms

The major concerns are:

- 1) shortage of farm labor,
- 2) increasing costs of production and
- 3) absence of concerted marketing strategy and presentation of product.

GREENHOUSE FLORICULTURE

After considerable discussion by growers, allied trade representatives, research and extension specialists in attendance, it was agreed that the identified research needs as outlined in the 1999 report should be similar but with the addition of one major issue and minor modifications to the remainder to reflect emerging issues. The chair circulated the research priorities and goals set out by the American floriculture industry through their national organisation, The Society of American Florists. As one would expect the research priorities and goals mirror in a very similar way those of the Ontario industry.

1. Integration of Nutrient, Water and Disease Management Strategies from an Environmental Perspective

The environmental impact of fertiliser, water and pesticide use in the greenhouse floriculture industry has become a topical issue in any discussion on greenhouse crop management. The industry is aware of the direction and initiatives that the Ontario government is proposing to insure clean water.

The application of nutrients through top irrigation is currently the industry standard to many cut flower and bedding plant crops. There is a need to understand what, if any, is the environmental impact of greenhouse run-off water under different cropping systems using top irrigation. Direct collection of excess nutrient solutions or use of biological filtering systems are but two possibilities that appear to be cost effective options available to growers.

Fertility requirements and the timing of applications need to be refined for individual crops to insure optimal growth and plant quality under both top irrigation and subirrigation systems. Floriculture consists of many different crops where no growth and quality parameters have been established or documented in response to changing fertility regimes. Yield response curves to different fertiliser rates have not been carried out for most floriculture crops in the same way as field crops such as corn or barley.

Closed, recirculating subirrigation systems is one option being adopted by potted plant growers. What are the root zone requirements of plants in closed nutrient recycling systems? Determination of water and nutrient budgets for different production systems and crops and how this relates to the incidence of disease and post-production quality is also needed.

Most growers in the industry feel subirrigation systems are not well suited for many bedding plants because growth and flowering has been controlled primarily through restricting water and fertilisers. The economics of these systems need to be closely evaluated to determine their applicability since bedding plant crops are short-term seasonal crops. The use of additional growth retardants is one option but not generally favoured because of the concern about garden performance. Determination of nutrient loss or waste in bedding plant production systems needs to be determined.

Long term cut flower crops such as roses and gerbera are now being grown in substrates such as coco coir and rockwool because of the potential to increase quality and production of flowers harvested. These systems were installed with the potential for recirculation. However these technological changes in water and nutrient use and management have created completely new problems including the impact of organic root exudates and the accumulation of undesirable ions such as sodium and chloride on growth and quality.

The technological changes that have occurred in water and nutrient management for both container grown and cut flower crops have occurred far more quickly than our knowledge of their impact on disease management. The impact of different plant pathogens such as *Fusarium*, *Pythium*, *Phytophthora*, *Rhizoctonia* and *Erwinia* in closed nutrient recycling systems on yield and plant growth is not well understood and requires quantification for a wide range of

floricultural crops. Currently growers with the capability to recycle nutrients have been thwarted in their recycling attempts because of serious disease losses, as high as 60-70% in some crops. Economic losses of this magnitude simply can not be sustained. As a result, the epidemiology of these pests within these systems needs further investigation. Research into the control of pathogens should include a two-pronged. The industry strongly supports the development and evaluation of biocontrol agents and protocols to insure their efficacy as a long-term objective to reduce pesticide usage. Technologies such as ozonation, UV radiation and heat treatment need to be investigated for their potential to control these pathogens given that the solution being treated is laden with nutrients.

Monitoring the efficacy of the technology described above is currently impossible for growers. Growers consider the need for grower friendly, accurate, rapid diagnostic tests to confirm the level of inoculum of the aforementioned organisms and others, an important goal to assist them in making informed production-oriented decisions.

2. Optimisation of the Greenhouse Environment

The sharp rise in fuel prices this year and the forecasts that prices may continue to rise brings the viability of certain sectors of the industry into question. In the early '80's during the previous energy crisis most growers installed energy curtains and replaced old glass structures with double polyethylene and increased production output through installation of rolling benches and concrete floors which increased usable production area from 65% to 85- 90%.

Today however, research is needed to develop even greater energy efficiencies through boiler and heating design modifications, improved computerised control of boiler/heating systems, the greenhouse environment and crop production management practices to minimise heat loss, achieve greater recovery of waste heat while not negatively impacting on crop growth. Evaluation of different greenhouse structures and ventilation designs from energy efficiency and disease management perspectives is needed. Is there any potential for greenhouse glazings to be improved to reduce heat losses?

3. Development of Improved Floricultural Crops and Production Techniques

Development and evaluation of new crops and new cultivars of existing crops for enhanced horticultural characteristics including improved plant growth habit and flowering characteristics, increased pest and disease resistance, and post-harvest shelf-life under Ontario growing conditions is considered important to all growers within the industry.

The retail sector thrives on the introduction of new and different crops. Although the sales of traditional cut flowers such as roses and chrysanthemums or flowering plants such as pot mums remain strong (still increasing in sales value) alternate crops are also becoming increasingly more popular.

In terms of the greenhouse environment itself, growers have over the past two decades become very efficient at using all the available space and utilising the latest technology to improve production and shorten production time frames. Manipulation of light quality and quantity for example, continues to be a key factor in shaping plant growth and development.

Plant modification research is needed to improve the efficiency and quality of existing and the new crops being developed in the following three broad areas.

The development of new cultivars with enhanced light harvesting qualities through gene manipulation to improve growth and quality during the low light winter months.

The development of better environmental control systems to manipulate the natural plant hormones including gibberellins and ethylene through a better understanding of the role of red and far red light at different times during both the light and dark periods.

The ongoing need for applied, production-oriented research to establish the best crop management practices including media and nutrition, chemical growth regulation requirements and cultivar evaluation under Ontario conditions.

4. Development and Implementation of IPM programmes in Floriculture

The industry is currently increasing the use of biocontrol systems to control insect pests. However, continued research is required on IPM strategies for several key pests, including western flower thrips, fungus gnats and shore flies and two-spotted mites in order to reduce the considerable pesticide input required to control these pests. Adoption is being slowed because of the lack of biocontrol friendly pesticides, many of which are already registered in the US.

Continued support of research projects that focus on the management of the western flower thrips and the tospovirus complex is needed because of the devastating losses that can occur. Crops such as cineraria and gloxinia can experience 100% loss. Understanding the chemical basis of plant resistance to the western flower thrips could be an important tool for plant breeding programmes.

Management studies to better understand the activity and damage caused by fungus gnats and shore flies and their role as vectors in the transmission of plant pathogens is increasingly more important.

Not only are studies of biological and cultural control strategies, including the impact of screening important, but priority should be given to the development and registration of compatible "biorational products".

Integrated disease management is not nearly as well understood as integrated insect management. Epidemiology studies of major disease causing organisms including *Pythium*, *Phytophthora*, *Rhizoctonia*, *Fusarium* and *Erwinia* are needed as a result of the rapid adoption of new irrigation technologies that have occurred within the industry. Losses can be significant; for example cyclamen losses due to *Fusarium* can average 15 - 20% in recirculating systems or calla lily losses due to *Erwinia* can be as high as 70%. Losses due to these two pathogens alone are in excess of \$5 million. Products claiming biocontrol and root growth enhancing properties are being promoted to the industry with limited scientific data. Evaluation of these biocontrol products is needed relative to individual disease organisms and crop specificity, their efficacy

within recirculating irrigation systems, and whether any potential antagonisms exist between biological organisms so that growers can establish a fully integrated pest control programme which includes both insects and diseases.

Assessing and understanding the vector relationship between disease pathogens causing root and crown rots and fungus gnats and shoreflies need to be addressed.

Botrytis and powdery mildew are both aerial pathogens that are constantly the scourge of the flower grower. The industry supports further research and development of biological control agents shown to be efficacious under typical commercial greenhouse climates.

Because bacterial wilt of geranium (*Xanthomonas campestris* pv. *Pelargonii*) is such a devastating disease of a key floriculture crop and the potential to lose consumer confidence, a serious need exists to investigate any potential genetic basis of incorporating resistance through biotechnology.

5. Post Harvest Handling and Shelf-Life Issues with Potted and Cut Flower Crops

Maintaining the shelf life of various flowering potted plants and bedding plants is an important issue for both growers and buyers from the large retail chains. Growers are concerned that they lose control of their product once it leaves the greenhouse and contact with individual store managers. In the world of mass marketing, the delivery process from greenhouse to the individual store requires a minimum of three to four days. Plant quality becomes a major concern as more and more of the products are sold through chain stores and supermarkets where the flowers are in contact with ethylene producing fruits and vegetables. In addition, as the export market grows, more floral products are being shipped longer distances by tractor-trailer.

Ethylene, both internal plant generated and/or external source, are causing serious plant quality problems. Reducing premature flower senescence, leaf yellowing and leaf epinasty is critical to the continued growth of flower sales through the mass-market outlets.

A vast array of new crops is being introduced to the market place every year. These new plants need evaluation for ethylene sensitivity and best shipping temperatures before introduction to the market. Technology transfer activities is a key component.

Assessment of the levels of ethylene present throughout the marketing chain has determined that problems can arise anywhere throughout the distribution system and that some of these incidents can be quite severe. Research needs to continue to focus on the use of ethylene inhibiting compounds, how they function and where within the production/distribution network these compounds can be utilised and the impact of greenhouse production factors on post-harvest responses. In the longer term genetic manipulation needs to be examined as a tool to provide commercial flower crops with an internal resistance.

LOW ACREAGE & SPECIAL CROPS

- 1) **Nutrient Management:** There exists a need to address information gaps on actual crop removal rate of nutrients, and the environmental effect of such nutrients, ie. phosphorus and nitrogen. In order to form the basis of nutrient management guidelines, nutrient uptake curves and the validity of current recommended rates must be addressed.
- 2) **Genetically Modified Organisms:** There exists a need to establish preliminary research with respect to G.M.O. products. If the United States accepts this practice and Ontario fails to do so our growers may be unable to compete effectively in the market place thus loss of a market and economic development opportunity (eg. Round up ready and liberty link sugar beets and chicory.)
- 3) **Minor Use Limitations:** PMRA has indicated its desire to limit the number of minor use submissions. The Research, Industry and Grower community will need to be more selective with respect to their priorities. Perhaps it is strategically important to submit crop groups for minor use submission rather than an individual crop.
- 4) **Good Lab Practices:** Limited certification progress has been made in this area. As of 2001, all residue trials will require to be conducted as GLP compliant. The agricultural industry relies on the University of Guelph, Laboratory Services and Agriculture and Agri-Food Canada to conduct trials. Without GLP compliance the trials cannot proceed and many minor uses may remain incomplete.
- 5) **Water Management:** The quality of water for irrigation and the washing of produce on the farm was raised. Can the on-farm water supply used for irrigation and the washing of produce be a threat to food safety and the farmstead operation!
- 6) **Grower Liability:** The increasing consumer concern with respect to the environment and food safety is making growers question their public liability within the production/distribution chain. In addition, to pesticide application and the introduction of genetically modified organisms, growers are expressing concern over environmental resources ie. air and water quality.

MUCK CROPS

Changes to Emerging Issues

1. The pea leafminer, reported as an emerging issue in 1999, is now a current issue.
2. Concern about nutrient management planning is increasing.
3. The leek moth was first seen in Ontario in the 2000 growing season on *Allium* spp.

Emerging Issues

Concern was expressed about the following new and emerging issues:

1. Growers are concerned about the impact of nutrient management plans (and expected legislation) on muck crops. Of particular concern is the applicability and accuracy of current nutrient parameters in assessing nutrient input/output of vegetable production practices on muck soils.
2. Leaf moth on onions and garlic.
3. Potential loss of *Fusarium* resistant cultivars of celery due to company restructuring.
4. Increasing problems with carrot rust fly late in the season and the probable occurrence of a second generation of carrot weevil in Ontario.

NURSERY/LANDSCAPE & TURFGRASS

Pesticides and integrated pest management.

The political and regulatory climate around pesticide use requires continued research into reduction in pesticide use, including improvements in IPM methods for all nursery/landscape/turf sectors (monitoring methods and thresholds, certification). There is also a need to pursue alternative pest control methods (biologicals, etc.) to provide low risk alternatives.

Improved understanding of plum pox virus

The effect, both actual and potential, of the plum pox virus will be significant in the nursery/landscape industry, as crops such as sand cherry are identified as potential carriers and subject to quarantine and destruction. There is a need for rapid improvement in our understanding of this disease, particularly the epidemiology and host range, so that control may be effective without inflicting severe economic impacts unnecessarily. Accurate surveys of the spread of the disease and understanding of the potential for genetically resistant *Prunus* types, as well as certification of resistant material, will be important in this regard.

Water use and management

While we escaped another long, hot, dry summer in 2000, there continue to be long term concerns about water supply, use, and conservation. Water was identified again as an emerging issue in the nursery, landscape and turf sector. Approaches to dealing with this issue are suggested in the research priority adopted by the subcommittee (Water Use and Management, below). There is increasing need for technology transfer to improve choice and proper use of irrigation equipment and proper irrigation scheduling, as well as tools and training to meet the regulatory requirements for water quality and quantity conservation.

Coordination of tech transfer and information tools

The committee once again identified the ongoing need to improve the means to transfer research and technical information to the industry in a timely and useful fashion. Improvements in University and OMAFRA websites were noted, and industry is making its own efforts to improve tech transfer (Landscape Ontario workshops and certification programs, industry newsletters, etc.) Nevertheless, there is the feeling that large amounts of pertinent information remain difficult for the industry to gain useful access to.

POTATOES

- 1. Nutrient Management Plans and Manure Management.** There is concern that the fertility levels recommended for potatoes in future Nutrient Management Plans may not be high enough to grow a profitable potato crop. The Ontario Potato Board will be involved in the consultative process of establishing the Nutrient Management Plans. For many years, manure has been widely used by vegetable growers to improve soil fertility. Recent research has indicated that manure applications reduce the incidence of scab, a serious problem of potatoes. Concerns regarding the use of manure and human health should be addressed.
- 2. Water Management and Quality.** Water availability, quality and management is a serious issue in the province. Rapid urban and industrial development has left growers sharing water resources with hundreds of new communities and factories. This affects both the quality and quantity of water available.
- 3. Food Safety.** Processors, packing plants or others in the food production and distribution chain may soon request a record of production practices with every load of potatoes to address food-safety concerns.
- 4. Consumer Acceptance of GM Potatoes.** Biotechnology has provided growers with varieties that are resistant to pests. However, agitation against Genetically Modified Organisms (GMO's) has been intense enough to lead many international food companies to think it will be impossible to sell GM food in there. These companies have similar concerns about the prospects for sales in North America.
- 5. Potato Wart.** In October 2000, some tubers infected with potato wart were found in a small section of a 62-acre field in PEI. Potato wart caused by the fungus Synchytrium endobioticum is a quarantinable disease, and Federal Quarantinable Regulations apply to fields where the disease is found. The US closed the border immediately to PEI potatoes after wart was detected. It is hoped that soon CFIA and APIS will reach an agreement that it is satisfactory to US and PEI potato growers.

SWEET CORN

1. Nutrient Management

In light of the upcoming nutrient management legislation, current information is required on crop nutrient uptake rates, and the environmental fate of nutrients in sweet corn production in order to confirm or update current OMAFRA fertility recommendations. The availability of qualified researchers and funding to complete this research is a concern.

2. Food Safety

With food safety becoming an increasingly important issue, direction needs to be given on safe handling practices, especially in the fresh market. Growers using water for hydrocooling need current information on proper management practices.

3. Declining research funds and personnel

Research funds are becoming harder to find, especially for commodity groups with no grower organization. Research and extension personnel are also in decline, which is a concern.

4. Length of time for pesticide registrations

Concern was expressed regarding the length of time needed to register new pesticides for sweet corn. This brought up the continued concern of imbalances between pesticides available to Ontario growers and those available to U.S. growers and the call for harmonization of pesticides within these two markets.

5. Food Quality Protection Act

While this is U.S. legislation aimed at reevaluating pesticide use and its impact on human health, there will be an impact on the availability of pesticides to Canadian growers or the ability of Canadian growers/processors to export food products to the U.S. which may have had certain pesticides applied to them. The sweet corn industry stands to lose some of its major insecticides as a result of this. While it may not be possible to prevent these losses, it is important to look for new alternatives.

6. Change in Pest Complex.

Pest problems continue to challenge the sweet corn industry. In previous seasons, Stewart's Wilt was a major problem, but this did not occur in 2000, likely due to the cool weather early in the summer which suppressed flea beetle activity. However, this cool weather did increase the severity of leaf rust, which was devastating in some locations. A new strain of rust has been identified in the southern U.S., and is felt to be present in Ontario.

7. Transgenic technology

Transgenic sweet corn could have a major impact on the sweet corn industry. Transgenic cultivars are a positive tool for growers, in terms of better insect control, area-wide suppression of corn borers, and more effective weed control. However, recent negative publicity has reduced the enthusiasm of growers and processors to use Bt sweet corn. Some Bt sweet corn has been grown by fresh market growers and sold without problems.

8. Quality of Fresh Market (early season) Sweet Corn

Concern was expressed regarding Ontario fresh market growers maintaining quality on a consistent basis. There is still poor quality corn finding its way onto the market, especially early in the season, which hurts the entire industry.

9. Coordination Between Bee and Sweet Corn Industries.

Progress has been made in identifying bee hives near sweet corn fields; however some beekeepers do not identify hive locations clearly enough.

TENDER FRUIT

- Bacterial spot - still a major issue on some peach and nectarine cultivars
- Continue tree fruit breeding programs at University of Guelph, Department of Plant Agriculture, Vineland Station staffing: breeding position (Neil Miles retired end of 1999), orchard management position.
- justification for staffing in preparation by U. of Guelph, Dept Plant Agriculture
- industry to recommend that position is located at Vineland, primary emphasis on research with service (extension) component. Not to be a teaching position at Guelph.
- Plum pox virus - continue efforts for detection and eradication/control National task force established to advise CFIA re prevention of this disease spreading into Canada
- Food safety - efforts to ensure food safety co-ordinated with industry practices and industry to be involved in establishing code of horticultural practices
- Nutrient management plan (NMP): need to know how pending provincial legislation impacts the tender fruit industry
 - may impact on use of manure and other organic amendments in orchards
 - Environmental Farm Plan may require NMP
 - few guidelines for perennial crops
 - concerns today may become issues in the future
- Shrinking tender fruit land base – need to expand to new areas

TOMATOES

1. Nutrient Management. The fresh and processing tomato industries need to fill information gaps on actual crop removal rates of nutrients and the environmental fate of such nutrients (particularly phosphorous and nitrogen.) Nutrient uptake curves and the validity of currently recommended rates must also be addressed as needed to form the basis of nutrient management guidelines. The availability of qualified researchers and necessary research funds to perform such work is also a concern.

2. Ageing demographics of scientific community. Staff demographics indicate that scientific and research support personnel who are involved in tomato research are aging and a high turnover is anticipated within the next 3 to 10 years. An example comes from the weed science area. Currently there is only one federal weed specialist serving the entire tomato industry and he is expected to retire within three years time. Additionally, there is a weed science vacancy at Ridgetown College - University of Guelph that remains unfilled.

3. Water management. There is increasing concern about the availability and quality of water for agricultural purposes (access to water for irrigation). Changes in weather patterns (hotter and dryer) as well as competition for water use makes water management an important issue.

REPORT OF ACTION TAKEN ON PREVIOUS RECOMMENDATIONS

I SAMPLE LETTER FOR RESPONSE TO RECOMMENDATIONS

Letters to the appropriate person/agency requesting a written response to the research and services recommendations of the various OHCRSC subcommittees.

II Date of response.

III Responses and Actions Taken on the Previous Years' Subcommittee's Recommendations.

Responses include the OHCRSC executive committee's responses, published in last year's Annual Report and distributed to the subcommittee chairs by January 18, 1999, responses by those individuals who were asked to comment on the specific recommendations as indicated in the sample letter (I), and actions taken by the subcommittees themselves.

SAMPLE LETTER FOR RESPONSE TO RECOMMENDATIONS

The following letter was addressed to the various individuals/agencies requesting their responses in a timely manner. On the following page is a list of individuals who were asked to respond indicating if and when they responded to the OHCRSC.

Dear

The Ontario Horticulture Crops Research and Services Committee has reviewed the 32 research and services recommendations brought forward by the various commodity subcommittees. As chair, I have been asked to distribute the recommendations which require responses from the appropriate individuals.

I would like to forward your reply to the appropriate subcommittee chair by the first week in March.

I have indicated the subcommittee making the recommendation, the address of its chair, the recommendation number and title, a brief outline of the issue involved, the response by the OHCRSC main committee, leaving a space for your response.

I appreciate your efforts in addressing the concerns of the many individuals whom have helped develop these recommendations.

SUBCOMMITTEE

Name and address of chair

Sincerely

Annette Anderson
Chair, Ontario Horticultural Crops Research and Services Committee (OHCRSC)
Ontario Ministry of Agriculture, Food and Rural Affairs

RESPONSES AND ACTION TAKEN TO THE PREVIOUS YEARS' SUBCOMMITTEE'S RECOMMENDATIONS

AGROFORESTRY

Recommendation 1

Sequestering Carbon dioxide
Reduced Nutrient Loading

The Agroforestry research group, University of Guelph, was successful in obtaining funding for CRESTech to utilize the Victoria Road agroforestry research site as a "Ground Truth" station. A CRESTech project entitled "Methods to quantify potential impacts of tree-based land use systems on climate change and carbon sequestration" using IKONOS imagery is currently underway. The researchers will receive high-resolution electro-optical visible imagery from the recently launched IKONOS satellite and validate the satellite data with our physical quantitative data obtained from the site over the past 13 years.

In 1999, through the Thomsen Corporation, Ottawa, Ontario, University of Guelph researchers received funds from the Climate Change Table to prepare two reports on agroforestry related land-use practices and its role towards curbing greenhouse gas emissions (N_2O) and carbon sequestration in eastern Canada.

The Phase 1 report identified the potential for agroforestry-related land-use for eastern Canada and expected adoption rates. The phase 2 report dealt mainly with quantitative measurements on greenhouse gas (N_2O) emission reduction and C sequestration measurements taken from the University of Guelph, Agroforestry Research Site (Reports are available on request). Based on these two reports, a journal article is in preparation for publication. During the year 2000, a fact sheet entitled "Enhancing Greenhouse Gas (GHG) Sinks and Nitrous Oxide Reduction Potentials in Agroecosystems through Tree-base Intercropping Systems-University of Guelph, Agroforestry Research Findings" was prepared for distribution among farm communities in southern Ontario and interested environmental groups.

Research results at the Victoria Road agroforestry site show that agroforestry based land-use (growing crops and trees unproductive cropland) can sequester four times more carbon than no-till conventional cropland.

During the year 2000, two tile-drain monitors were purchased. The monitors will be installed this fall and soil leachate samples will be collected beginning in the spring of 2001. Soil leachate analysis could potentially fill many gaps in the N cycling model that was developed for the agroforestry site at Victoria Road.

A proposal submitted to the Livestock Environmental Initiative Committee (LEI) titled "Enhancing Carbon Sinks in Agroecosystems using a Silvopasture Approach" has been approved for funding for a period of two years beginning in 2001.

Prepared by: Naresh Thevathasan and A. M. Gordon, U. of Guelph

Recommendation 2

Extend Ice Storm Recovery Projects

Approval has been granted to extend implementation of the ice storm recovery research to December 2001. This change will make implementation of programs funded as part of the Disaster Relief Assistance Logistically feasible.

In 2001, OMAFRA and MNR will be developing a proposal to extend certain components of the Ice Storm Research Project Beyond 2001. It is expected that research related to the impact of the ice storm on the productivity of sugarbushes and work related to tree nutrition and soil amendment treatments will be given high priority for extension.

Prepared by: Dave Chapeskie, OMAFRA

Recommendation 3

Support Commercial Nut Culture and Cultivar Evaluations at H.E.S. Simcoe.

This work continues and is seen as essential to providing a strong foundation for an expanded nut tree planting program in the future. Results from this work should lead to more operational successes due to improved selection of cultivars and more effective cultural practices.

Dr. Adam Dale of HES Simcoe, University of Guelph, has indicated interest in conducting breeding work to produce new cultivars of sweet chestnut having either resistance or tolerance to chestnut blight disease. Chestnut blight remains as the primary hurdle for both forestry and orchard food production.

Prepared by: Dave Chapeskie, OMAFRA, Todd Leuty, OMAFRA and
Doug Campbell, Commercial Nut Growers

Recommendation 4

Investigate the Rural Economic Potential of Harvestable Timberbelts as "working" farm trees.

Educational workshops for landowners in southwestern Ontario have been delivered at the Southwest Ag Conference and OSCIA local meetings which emphasized the value of timberbelts and windbreaks as part of the whole farm enterprise. Essex and Kent Counties were targeted because forest cover in these areas is seriously depleted and benefits are obvious to many interest groups.

Feedback from attending farmers showed very positive interest but must focus on the profitability aspects of wood production, crop yield increase, soil conservation and a design which will minimize crop consumption by wildlife using the tree rows as travel corridors. Several farmers are already leading the technology on timberbelt management around farm field perimeters and have generously shared their ingenuity.

Prepared by: Todd Leuty, OMAFRA

Recommendation 5

Evaluation of Buffers along Watercourses on Farms

The Ontario Soil and Crop Improvement Association (OSCIA) and the Grand River Conservation Authority implemented this project. The investigation and analysis is now complete. Forty farm buffer strips were visited, and the landowners interviewed. The final report is now available from OSCIA.

Prepared by: Andrew Graham, OSCIA

Recommendation 6

Sanitation and Cleaning of Maple Tubing

This applied research work has been carried out at the University of Guelph-Alfred Campus. Several treatments were evaluated in a 3rd year of testing in the spring of 2000. A report summarizing the results of the research for the 2000 season is available. A report summarizing the results of three years of research will be available in the winter of 2001.

OMAFRA will be working closely with researchers at Alfred and representatives of the Ontario Maple Syrup Producers Association to determine follow-up needs in 2001.

Prepared by: Dave Chapeskie, OMAFRA

Recommendation 7

Registration of Insecticides for Nut Trees

There has been further discussion of product alternatives by OMAFRA staff and a final list of products has been selected. (Refer to Appendix 2 in this Report). OMAFRA is seeking a Minor Use designation for these products.

Prepared by: Todd Leuty and Dave Chapeskie, OMAFRA

Recommendation 8:

Registration of the Herbicide Stinger for Use in Christmas Tree Plantations

There has been further discussion regarding a number of herbicides which if approved for use should help Christmas tree growers manage weeds in their plantations. Herbicides which will control triazine resistant weeds and an approved tank mix of round-up and simazine are especially needed.

Minor Use Registration will be pursued for the selected herbicides (Refer to Appendix 2 of this Report). The support of the Christmas Tree Farmers of Ontario (CTFO) for this work has been obtained.

Prepared by: Todd Leuty and Dave Chapeskie, OMAFRA

Recommendation 9

Continue Maple Production Agriphone Service

OMAFRA has supported continuation of this service in 2000 and plans are underway to offer the service again in 2001.

Prepared by: Dave Chapeskie, OMAFRA

Recommendation 10

Laser and GIS Technology for Line Layout and Inventory in Sugarbushes

The North American Maple Syrup Council, the Ontario Maple Syrup Producers Association, Dendron Resources Inc. and OMAFRA are supporting Phase 1 of this project. Phase 1 involves evaluation of the equipment in a field environment. The intent was primarily to assess productivity and costs at least in a preliminary way. The field evaluation work was carried at several sites in Lanark County. Dendron Resources Inc. is currently preparing a report for Phase 1 work.

Once the Phase 1 report is available the partners will decide whether or not follow-up is warranted.

Prepared by: Dave Chapeskie, OMAFRA

Recommendation 11

Safe Use of High Pressure Steam in Maple Operations

Financial support for research related to the safe use of steam was obtained from the North American Maple Syrup Council. Clarence Coons, Agroforestry Consultant was retained to complete a technical report on the subject. This report has been completed and is being made available to maple producers in Ontario and elsewhere. A copy of the report has been posted on OMAFRA's website.

Prepared by: Dave Chapeskie, OMAFRA

Recommendation 12

Maintain Sweet Tree Cloning Trial

This project has been maintained at a very small scale at both Kemptville and Guelph locations- University of Guelph. Todd Leuty is evaluating an alternative technique to rooting the maple cuttings under mist. This technique involves the concept of layering and may have advantages over the cuttings-mist bed option.

Dave Chapeskie presented a poster on this project in 2000 at the North American Maple Syrup Council meeting in Burlington, Vermont. More effort is needed to secure financial support for the continuation of this project.

Prepared by: Dave Chapeskie and Todd Leuty, OMAFRA

Recommendation 13

Registration of Insecticides for Nut Trees - continued

Follow-up is reported under Recommendation #7 above.

Actions of Issues Previous to 2000:

Tree Roots and Tile Drains

Farmers frequently request clarification on interactions of roots and farm drainage systems at workshops. Many decades of industry experience with clay and plastic tiles indicates that roots of trees and other vegetation can create blockage problems in farm drainage systems where the situation allows it. Engineers and Drainage contractors use a strategy, which helps avoid costly repair problems to farmers when designing and installing farm drainage systems.

Understanding that new learning is always an objective, extension requests that caution be exercised with the issue of tile drains and roots, primarily where a project moves from research to field application. An information sheet has been prepared to explain the tile issue from an industry perspective, and to expand on the current OMAFRA recommendations on separation distances between drainage tile and specific species of vegetation.

Prepared by: Todd Leuty, OMAFRA

APICULTURE & POLLINATION

Report Of Action Taken On The 1999-2000 Recommendations:

The 2000 recommendations were directed to the appropriate agencies. The response is reported on page 147 of the 1999 annual report of the OHCRSC to OASCC.

The small hive beetle is currently known to be within 5 km from Ontario apiaries. The Apiculture and Pollination subcommittee feels that this could have a large impact on the beekeeping industry and could seriously affect availability of bee colonies for pollination. The Apiary inspection program inspected many bee colonies and located the small hive beetle in apiaries in NY. Similar inspection was conducted in apiaries located in Ontario revealed that the small hive beetle has not made it to Ontario yet. Monitoring and initiation of research to develop methods for detection and control are critical at this time. Prompt action should be taken by the appropriate agencies (OMAFRA, CFIA, OBA) to alleviate this problem. This issue has become the highest priority of the beekeeping industry in Ontario for 2001. Two resolutions regarding the small hive beetle were passed at the OBA annual meeting. These resolutions have been forwarded to the Canadian Honey Council for action at the Federal level.

APPLE

Recommendation:

Decline in Tree Fruit Pathology Research, particularly apple, in Ontario. The Ontario Apple Research and Services Committee requests that AAFC, Vineland, OMAFRA, ERLD, OASCC undertake a review of the fruit pathology positions before Dec. 1st, 2000 with a view to ensuring continuity of research efforts at the January 1, 1999 level.

Response:

On file with OHCRSC (source: Annette Anderson) – AAFC has set as their target the end of January 31, 2000 to have reviewed the fruit pathology position under their jurisdiction. This recommendation is requesting a broadening of the review to include positions governed by OMAFRA and the University of Guelph. Dr. Frank Marks offered to initiate a joint review to include all the necessary partners to review overall fruit pathology needs. A letter will be sent to Dr. Clarence Swanton, Dept. of Plant Agriculture and to Bill Ingratta, Director of Crop Technology, to inform them of this review.
No further written responses have been recorded.

BERRY CROPS

Responses to 1999 Recommendations

Recommendation 1 - Pesticide Registration

The Ontario Berry Crops Research and Services Subcommittee recommends that the Crop Protection Institute (CPI), the Pest Management Registration Agency (PMRA) and the Pest Management Research and Services Committee strongly encourage pesticide companies to pursue joint registration of new pesticides in Canada and the US.

We recommend that harmonization between PMRA and EPA be strengthened to promote joint registration of pesticides in Canada and the US.

Response

In compliance to the new restructuring of OASCC, the OHCRSC will direct this recommendation to the chair of the OPMRSC, Dr. Mary Ruth McDonald. The issue however is critical to the survival of the horticultural industry in Ontario and the OHCRSC is prepared to offer further suggestions and to work with the OPMRSC. The recommendation to PMRA and EPA to harmonize their registration protocols has not resulted in the necessary actions to date. Companies need to pursue and initiate joint registrations. There seems to be differences at the head offices in the understanding of the need to pursue joint registrations involving amongst other issues as liability and testing/data sharing. This needs to be made known to the company CEOs. In addition the newest employee of the OFVGA, Craig Hunter has offered to further the cause of harmonization through his new duties. Further a workshop on Minor Use issues, including the legal branch, and pesticide company executives and the appropriate associates will be undertaken in an attempt to convince some to work closer with this program which has certainly proved beneficial to the horticulture industry.

Response from Craig Hunter Via a phone message Nov 7/00

There has been progress in the last year. We now have a much closer working relationship with the US IR4 program. Over the last year we have also developed a better working relationship with the pesticide companies by working through their American parent companies. We currently have joint research projects with IR4 where they provide the lab analysis which saves considerable costs. They will also share the rest of their data packages with us in exchange for the work done in Canada. Mainly we are working on brand new chemistry. We have initiated a project for joint registration of a minor use product with the hope of more joint reviews in the future.

Recommendation 2 - Rapid Disease Diagnosis

The Ontario Berry Crops Research and Services Subcommittee recommends to the University of Guelph and the Ontario Ministry of Agriculture, Food and Rural Affairs, cooperate to equip, staff and train the Pest Diagnostic Clinic to conduct PCR and other rapid diagnostic procedures in a timely and efficient manner.

Response

Laboratory Services, University of Guelph has the necessary equipment to conduct PCR-based diagnostic analysis. A letter will be sent to the Manager of Analytical Services, John Melichercik, requesting the development and publication of a business case for the implementation of this technique both for research purposes and routine client analysis. It is through a business case that will determine the feasibility of developing further PRC-based diagnostic research in the future. The OHCRSC will recommend to funding agencies that new research proposals will require their own business case reflecting the findings of the Lab Services information. OHCRSC was made aware of a meeting Dr. Gary Whitfield, AAFC Harrow, was having with industry representatives (Berry growers) to develop virus testing protocols possibly using PCR technology. Discussions with John Melichercik are recommended.

Response from John Melichercik

May I start by first thanking you for your interest regarding the establishment of PCR-based diagnostic services within the Laboratory Services Division (LS). I have recently had an opportunity to discuss this topic internally with Marc Sabourin of our Pest Diagnostic Clinic (PDC), as well as members of our Molecular Biology group.

LS certainly does have the expertise to establish and provide PCR-based methods for the diagnosis of diseases in berry crops. The PDC does not currently have the equipment to support the delivery of PCR-based methods, but the capability exists elsewhere within the Division. However, current human and financial resources are insufficient to provide regular diagnostic services using PCR-based methods.

Our ability to bring on new analytical and diagnostic capabilities is largely a function of whether the revenues accrued from the delivery of a new service will cover the costs of the resources required to establish and support the service, on an on-going basis, within the Division.

In terms of "routine client analysis", it has been our experience that the number of requests for disease diagnosis on berry crops at the Clinic is insufficient, in terms of sample volume, to

support a business case for the establishment of these services at this time. Furthermore, if it is envisioned that this service would be provided on a fee-for-service basis, market research would be required to determine the price sensitivity of potential clients. Simply put, if the charge for this service would be more than prospective clients are willing to pay, then there is no market opportunity for such a service.

That being said, the PDC is keenly interested in pursuing avenues towards introducing this powerful diagnostic tool within its range of services. We are aware of the pressure exerted on researchers, by granting agencies, to have the results of their research available to producers in the form of diagnostic tests. Other commodity groups are facing similar demands and it might be possible for you to develop a common approach (or pool resources) to that end. In the case of berry crops, it may be more appropriate to also offer PCR-based diagnostics for the screening of disease in propagation material. In so doing, it may then become more cost-effective to run the occasional "diagnostic" sample along with a much larger volume of "screening" samples. Follow-up discussions on the establishment of PCR-based methods for the diagnosis of diseases in berry crops will need to address the following issues: (i) that sufficient "new" funds would indeed be made available to cover the additional human resource, equipment, consumable and other associated costs of establishing/maintaining these services, and (ii) that accurate market research data, providing solid numbers upon which to base future projections for potential revenues that would be derived from such services, needs to be generated and made available to LS.

I look forward to receiving your continued comments on this topic.

Recommendation 3 - Continuity of Nematology Research

The Ontario Berry Crops Research and Services Subcommittee recommends to Agriculture and Agr-Food Canada (AAFC), Vineland open a new position in nematology, initially on a term basis if necessary, to attract a well-trained scientist and provide continuity in the nematology program.

Response

Dr. Frank Marks, AAFC, London is aware of the Berry Subcommittee's interest as well as others who have expressed a need for nematology expertise in this province. Dr. Marks is on record expressing AAFC's intent to fill a nematologist position at the time of retirement of the current nematologist.

Recommendation 4 - Re-Cropping Restrictions for Long-Term Herbicides on Berry Crops

The Ontario Berry Crops Research and Services Subcommittee recommends to the Expert Committee on Weeds Canada and to the University of Guelph, that weed management research programs at the University of Guelph expand to determine the intervals required between application of new herbicides and planting of berry crops.

We recommend that the Expert Committee on Weeds Canada request that companies provide information on re-cropping restrictions on berry crops with their registration package.

Response

Referred to Dr. Chris Hall, University of Guelph, Chair of the Expert Committee on Weeds Canada.

The OHCRSC recognizes that an additional effort will have to be made to address this recommendation. In this era of fixed government resources the OHCRSC would like the Berry Subcommittee to indicate how this is to be accomplished, ie what projects presently being undertaken will be put aside or what additional funding is to be acquired to address this urgent request.

Response of Dr. Chris Hall - none to date

MUCK CROPS**Report of Action Taken Since Last Annual Report**

No direct responses were received to recommendations submitted in 1999 to OHRSC and OPMRSC. However, the following progress can be noted:

1999 Recommendation 1:**"Good Laboratory Practices" registered facilities in Ontario.**

Simcoe Research Station, University of Guelph, has recently been certified as GLP-compliant and the Muck Crops Research Station intends to be certified prior to the 2001 field season. There is still a shortage of GLP-certified analytical labs in Ontario, however.

1999 Recommendation 2:**Pesticide Harmonization.**

Some progress has been made towards harmonization of the registration process for new active ingredients by Canadian and US regulatory systems. However, Canadian growers are still at a disadvantage due to a lack of harmonization of the availability of currently registered products in both the US and Canada.

NURSERY/LANDSCAPE & TURFGRASS

Report of Action Taken on Previous Year's Recommendations

The Nursery, Landscape and Turf subcommittee acknowledges the support of the OHCRSC parent committee with respect to last year's recommendations.

Responses to last year's recommendations were discussed at the fall meeting.

The progress on filling the turfgrass management position at the University of Guelph is gratifying. This position should finally be filled in summer of 2001

Research programs continued to address industry needs as evidenced by the continuation of projects and the initiation of new research efforts designed to meet stated concerns. The support of service personnel in extension and lab areas is also appreciated and continues to meet industry expectations.

POTATOES

2000 Recommendation.

The committee recommends that the Canada Pesticide Institute (CPI) and the Expert Committee on Weeds for Eastern Canada request that Chemical Companies include in the label of newly registered herbicides the interval required between application of new herbicides and planting of potatoes.

The committee did not receive any response to this recommendation.

SWEET CORN

Report of Action Taken on Previous Recommendations

Recommendation 1 from 1999

"The Sweet Corn Research and Services Subcommittee recommends to the Pest Management Regulatory Agency (Health Canada), the Crop Protection Institute and to the Ontario Pest Management Research and Services Committee that PMRA work to simplify and speed up the registration process for new products, in order to encourage agriculture chemical industries to submit labels covering the same crops in Canada and the U.S. for equal availability of new pesticides over a range of crops."

Response: Referred to Dr. Mary Ruth McDonald, University of Guelph, Chair of OPMRSC

Update: The committee feels the process is getting better. But there are still improvements to be made.

Recommendation 2 from 1999

"The Sweet Corn Research and Services Subcommittee recommends to the Pest Management Regulatory Agency (Health Canada), and to AAFC that increase funding be made available to the minor use registration process in order to allow research institutes to upgrade and maintain GLP standards."

Response: Referred to Dr. Mary Ruth McDonald, University of Guelph, Chair of OPMRSC

Update: Ridgetown is not currently GLP compliant, Simcoe was recently audited, Harrow is working on it.

TENDER FRUIT**Report of Action Taken on Previous Year's Recommendations****OHCRSC 31 (TFRSSC 98-1)**

Evaluation of site suitability (climate, soil, topography, etc) for the expansion of tender fruit production outside of the traditional Niagara area:

Action: A small team was put together to deal with the recommendation; Ken Slingerland, Dr. David Hunter, Karl Evans and Adrian Huisman. Meetings were held in January and February to discuss a plan of action. Dr. Chris Duke and Dr. Richard Protz from the U. of Guelph, Land Resource Science Department, provided input.

January 20, 2000 - A peach and pear information meeting was organized by Nabisco, the Marketing Board and OMAFRA at the OMAFRA/University of Guelph Simcoe office. 56 growers and potential growers attended presentations covering; The Need for Expansion; Varieties and Production Methods; Pest Management Considerations; Financing and Cost of Production.

April 13 - Peach pruning for central leader training was demonstrated by Ken Slingerland to local growers in the Cedar Springs and Harrow area. Karl Evans and Ken Slingerland visited 15 potential grower sites from Dunnville to Harrow along the north shore of Lake Erie.

April 26 - A survey was mailed to over 130 growers on present and historical mailing lists. Student, Leigh Walters, phoned growers and compiled data during June to August, 48 growers responded to questions dealing with; historical experience and winter injury; grower concerns for planting new orchards or expanding present orchards; availability for irrigation; and other comments. A map was also included to mark their farms and any other past peach farms. A brief summary indicated that most growers lost all or most of their crop last in 1994; a wide variety of concerns from marketing, processors pricing; labour; profitability; hail and winter injury. Over 50% had access to irrigation if they planted peaches.

May 11 - cling peach trees were planted at a trial (Chester Stenclik) in Vittoria. Vulcan (40 trees), Vinegold (80), Virgil (80), V-84072 (80), Venture (80), V-85169 (45), V-851610 (10), V-

84061 (58). Trees were pruned two weeks later and trunk measurements to record growth will be taken annually. Other measurements to be recorded annually include: winter injury, amount of bloom, amount of crop, and other tree characteristics.

May 16 – Ken Slingerland and Leigh Walters surveyed north shore of Lake Erie from Cedar Springs to Port Dover.

Summary: There are many suitable sites along the entire north shore of Lake Erie. There are many positive signs and grower experiences to indicate that these are viable areas, however, there is more risk than compared to the Niagara Peninsula below the escarpment. Growers have already expressed their interest in planting by placing orders for processing peach trees. An estimated 100,000 trees have been ordered over the next two years.

OCHRSC 32 (TFRSSC 99-1)

Plum Pox Virus (PPV) Disease of Stone Fruits

Action: National and Ontario Task Forces and a Science Panel were established and provided guidance to the CFIA. Orchards and nurseries were surveyed during the 2000 growing season. The AAFC Science Panel has developed a preliminary research plan addressing both short-term and long-term research needs. An industry workshop was held with experts from Europe (France, Spain) and the USA. Researchers, extension workers and industry representatives from the US and Canada met in Pennsylvania at which discussions were held to initiate an "Inter-State Cooperative PPV program"; Canada was invited and strongly encouraged to participate in this program.

Summary of current situation in Ontario

Surveys conducted throughout the summer 2000 have indicated that PPV has become well established throughout the tender fruit production areas of Ontario. Positives have been found in Niagara, Haldimand-Norfolk and Kent. Evidence indicates that the disease has been in Ontario for more than 8 years. The fact that it has become well established in Niagara and has been found in other tender fruit growing regions of Ontario indicates that long term plans must be made to eradicate the disease and, failing that, keep the disease at the lowest possible level of infection. Factors contributing to the seriousness of the disease include the following:

- Production is concentrated in a small geographical area
- The contiguous nature of orchards provides easy conditions for aphid dissemination
- A possible propagation linkage caused wide dissemination of the virus
- Both fruit trees and ornamental nurseries operate within infected areas

Prohibitions of Movement are now in place at those orchards where positive trees were found. The same restrictions apply to susceptible species in ornamental and fruit tree nurseries within Towns or Townships where positive trees were identified. Quarantine zones will be established following meetings and consultations later this year or early in 2001. During the year the National and Ontario Task Forces and the Science Panel provided guidance to the CFIA. At this time 12000 trees have been removed in the first phase of the eradication action. The CFIA is still

hoping to eradicate this disease and is putting plans in place for the best way to proceed. Future actions will be decided before the 2001 season. A nursery certification program to ensure a supply of healthy trees has been proposed and will be further discussed.

Strong actions are required by all players to assure that PPV does not spread further and, in fact, does not become a limiting factor in tender fruit production.

OHCRSC 33 (TFRSSC 99-2)
Interim Tender Fruit Tree Survey

Action: No response was received from OMAFRA Policy Analysis Branch. This recommendation is to be resubmitted in 2000 for action in 2001.

OHCRSC 34 (TFRSSC 99-3)
Continuing the tender fruit breeding and management programs at the University of Guelph, Vineland.

Action: Dr. Swanton, Chair, Department of Plant Agriculture, has indicated that the breeding position is in the process of being staffed, and that the orchard management position will be filled internally.

TFRSSC will resubmit this recommendation to ensure that the positions are in place for the 2001 growing season.

TFRSSC also noted with concern that 2 other positions at U. of Guelph, Vineland, will not be in place for 2001: pest management contract position; engineering position.

OHCRSC 35 (TFRSSC 99-4)
Revise OMAFRA Publication 430 "Fruit Cultivars".

Action: OMAFRA will not be publishing a hard copy, but a revised version could be posted on the OMAFRA web site.

Prior to re-submission, this recommendation will be amended to indicate that TFRSSC will establish a working group to update commodities as soon as possible (first priority: peach, nectarine, cherry; second priority: plum, pear). OMAFRA support will be required for publication on the web site, with a limited number of hard copies to be available as a reference at the local level.

OHCRSC 36 (TFRSSC 99-5)
Organophosphate Review by PMRA, FQPA Impact and Identification of High Priority Pest Control Products and Potential Alternatives

Action: The PMRA review is continuing, but the lack of feedback from PMRA is a major concern. There is no real organized process for input from the industry to PMRA.

As it is anticipated that the next stage of the FQPA review will include fungicides (especially EBDCs, sterol inhibitors and Rovral), this recommendation will be resubmitted with an emphasis on the need to include the evaluation of high impact fungicides and potential alternatives.

OHCRSC 37 (TFRSSC 99-6)

Fire blight management

Action: Funding of the fire blight contract research at AAFC-Vineland has been re-negotiated through March 2002, with a new MII matching cash contributions and additional A-based funding.

OHCRSC 38 (TFRSSC 99-7)

Black Knot

Action: Research information was reviewed and submitted in February 2000. Ascospore release studies on plum and sour cherries were conducted by John Northover in summer 2000. Sovran was included in fungicide performance trials. Results are expected in July 2001.

STRATEGIC DIRECTIONS/PROBLEMS OR ISSUES/ SECTOR PRIORITIES

AGROFORESTRY

1. Sequestering atmospheric carbon dioxide and reduction of nitrous oxide emission through efficient cycling of nitrogen and reduced nutrient loading. Agroforestry related land-use practices (e.g. cropland and pastureland shelterbelts) have potential to - (a) Sequester atmospheric carbon dioxide in both the tree and soil component of the system, and (b) reduce nutrient loading to adjacent waterways through the development of efficient nutrient cycling systems.

Proponents: Andrew M. Gordon and Naresh Thevathasan, University of Guelph.

2. Assessing the effects of vegetative filtering systems in tree-based intercropping systems against harmful microorganisms. The N cycling model developed for the agroforestry research site at Victoria Road suggests that tree roots potentially trap 50% of the leached nitrates. This suggests that tree roots could also potentially filter harmful organisms such as coliform bacteria including E.coli especially from manure runoffs and soil leachates.

Proponents: Andrew M. Gordon and Naresh Thevathasan, University of Guelph.

3. "Ground truth" station and IKONOS satellite image analysis. The proposed Centre for Research in Earth and Space Technology (CRESTech) research will assess the suitability of using IKONOS data as a management tool to measure Leaf Area Density (LAD) for each tree species. The study will also involve the use of high special resolution imagery to measure tree canopy diameter and canopy depth in order to measure the LAD. The latter will provide an important management tool in order to determine pruning regimes in tree-based intercropping systems especially when the extent is large. In addition, it may be possible to estimate carbon content using LAD in conjunction with proper biomass equations.

Proponents: Andrew M. Gordon and Naresh Thevathasan, University of Guelph

4. Extend the Environmental Farm Plan (EFP) Program. The Ontario Farm Environmental Coalition (OFEC) will have to wind down the EFP program by the spring of 2001, unless dollars necessary to see this successful program evolve are secured through federal and provincial governments and other sources. EFP workshops will continue to be scheduled for the upcoming winter and EFP Incentive claims will be honored on a first-come, first-served basis. However, the entire program will be terminated when the current funds are exhausted, unless other funds can be secured.

Proponent: Andrew Gordon, OSCIA

5. Ensure necessary technical, financial and monitoring support for Ontario's Seal of Quality Program for Maple Producers. The Seal of Quality Program for Maple Producers

has been developed and implemented by the Ontario Maple Syrup Producers Association (OMPSA). The main objective of the program is to help ensure consistent production of high quality maple products. The program is a voluntary self-improvement initiative, which helps participants identify opportunities to improve their production practices in a manner that will help ensure the sustainable production of high quality maple products. The program is very similar in concept to the Environmental Farm Plan (EFP). Over 100 maple producers have already joined the SOQ Program.

The Ontario Maple Syrup Producers Association (OMSPA) may identify specific areas where assistance is needed. OMAFRA will work with OMSPA to pursue assistance if needed.

Proponent: *Dave Chapeskie, OMAFRA*

6. Extend ice storm research projects in eastern Ontario where this is needed to realize objectives. The implementation of ice storm recovery projects in Eastern Ontario is approved with necessary funding support to December 31, 2001. OMAFRA, MNR and the Ontario Maple Syrup Producers Association have identified the need to seek approval and funding to extend some of the projects beyond 2001. The currently approved program only provides two or at most three years of replicated results regardless of the nature of the project. It will not be possible to obtain conclusive results from certain projects (e.g. effects of the ice storm on the productivity of sugarbushes, tree nutrition and the effects of fertilization etc.) without an extension.

In 2001, OMAFRA and MNR with input from the organized industry will identify those projects, which should be extended and will attempt to secure funding support for this.

Proponents: *Dave Chapeskie, OMAFRA, Cathy Nielsen, MNR and Don Dodds, OMSPA*

7. Prepare a status report of commercial nut culture and cultivar- evaluations for managed nut orchards-H.M.S. Simcoe. Members of the Agroforestry Subcommittee see the evaluation work at H.M.S Simcoe as very valuable. In order, to help members of the Committee and others better understand the status of this work and maintenance needs, researchers responsible for this work will be asked to formally report to the Agroforestry Subcommittee in 2001. An alternative would be to appoint tree nut horticulture to tag with the pome fruit or tender fruit subcommittee if it is more suitable for the evolution of the nut industry.

Proponents: *Dave Chapeskie, OMAFRA and Todd Leuty, OMAFRA*

8. Consolidate technical resources related to the establishment and maintenance of timberbelts, shelterbelts and windbreaks. There is considerable opportunity for the establishment and maintenance of timberbelts, shelterbelts and windbreaks on farms, especially in southwestern and parts of eastern Ontario where tree cover is a luxury. Extension personnel working with OMAFRA, MNR, Conservation Authorities and other

groups need improved access to technical and economic information related to this topic. It is proposed that a literature search be carried out and that an easy-to-access directory of technical resources (including where they can be obtained), and other sources of assistance (e.g. specialist personnel) be prepared. This exercise will help identify gaps for future research.

Proponents: *Dave Chapeskie and Todd Leuty, OMAFRA*

9. Determine need for follow-up research and demonstration related to the sanitation and cleaning of tubing systems. Three years of applied research designed to evaluate alternatives to sanitize and clean maple tubing has been completed at the University of Guelph-Alfred Campus. A final report summarizing the results of this work will be available in 2001. This information will be accessible to maple syrup producers in Ontario and elsewhere. OMAFRA and OMSPA will work with researchers at the University of Guelph to determine the need for future research and supporting field demonstration sites on the subject.

Proponents: *Dave Chapeskie, OMAFRA and George Fowler, OMSPA*

10. Investigate steam boiler types available for use in the production of maple products. The North American Maple Syrup Council, OMAFRA and OMSPA continue to support research projects related to the use of steam in the production of maple products. Reports documenting the use of steam in maple production facilities and the safe use of steam are already available. It is now recommended that we review the types of boilers available and suitable for use in maple operations. There is also a commitment to produce a reader-friendly brochure on the use of steam in maple enterprises.

Proponents: *Dave Chapeskie, OMAFRA and George Fowler, OMSPA*

11. Pursue registration of insecticides for use in commercial nut orchards. In 2000, OMAFRA has taken a critical look at the needs of the nut tree industry and have now identified a number of products needing registration. (Refer to Appendix 2). The assistance of OMAFRA's newly appointed Program Leads with responsibilities for this specialized area will help expedite the registration of the selected products. This work is essential in order to help ensure a successful nut industry in Ontario.

Proponents: *Todd Leuty and Dave Chapeskie, OMAFRA.*

12. Pursue registration of herbicides for use in christmas tree plantations. At present only roundup and simazine applied as single treatments are registered to control grass and weeds in nut orchards and Christmas tree plantations. There is a need to allow for tank mix of these two products for reasons of operational efficiency. Also, there is a need to register other herbicides, which will control a fuller spectrum of weed species. In 2000, OMAFRA assessed the herbicides potentially available and prepared a list of products for registration (Refer to Appendix 2).

Proponents: *Todd Leuty and Dave Chapeskie, OMAFRA*

13. Pursue support for follow-up of Sweet Tree Maple Cloning Work. A plan for follow-up will be prepared by OMAFRA with input from the Ontario Maple Syrup Producers Association. Funding will be pursued to allow for longer-term implementation of this work.

Proponents: *Dave Chapeskie, OMAFRA, Todd Leuty, OMAFRA and Ron Hubbs, OMSPA*

14. Project: Maple Tapping Analysis - This project will model the effect of tapping maple trees based on current growth and yield information and recommended tapping practices. The model will test various tapping regimes and graphically demonstrate the effect of tapping on maple stems.

Proponents: *Mark Richardson, Eastern Ontario Model Forest and Dave Chapeskie, OMAFRA*

15. Determine if there is a niche for laser and GIS technology for sap line layout and inventories in Sugarbushes. The potential applications of this technology in Sugar bushes have not yet been determined. After limited field investigations in 2000, Dendron Resources Inc., OMAFRA, OMSPA and other partners will discuss the application of this technology and determine whether or not further investment in research is justified. Possible application in operational sugar bushes and long-term research plots will be discussed. Funding will be pursued if the partners decide that it is worth the investment in research.

Proponents: *Andy Welch, Dendron Resources Inc. and Dave Chapeskie, OMAFRA*

MINOR USE PESTICIDE REGISTRATION WISH LIST TO OHRSCC & OPMRSC

Sub-Committee: Agroforestry

Submitted by: Todd Leuty / Dave Chapeskie

Overall Rating	Chemical Name	Brand Name	Company	Crop		Registration Status				Justification									
				Imadacloprid	Admire	Bayer	Grape	Grape and potato leafhoppers	CDN	USA	IR4	1	2	3	4	5	6	7	8
Example																			New varieties planted more susceptible.
Insecticides and Acaracides																			
1	Superior Oil 70 Priority #1	Superior Oil	Bartlett		Tree nuts	Aphids, mites, scale	✓	✓	P	X		X		X		X		X	New commercial nut crops, 2,500 acres and increasing annually. Excellent fresh market potential.
2	Bacillus thuringiensis	Dipel	Abbott Labs		Tree nuts	Spring feeding caterpillars	✓	✓	P	X		X		X		X		X	
3	Carbaryl Priority #2	Sevin XLR Plus	Rhone Poulenc		Sweet chestnuts	Leaf hopper, weevils	✓	✓	P	X		X		X					Young orchards very susceptible to leafhopper burn. Weevil - harvest/storage pest
4	Indoxacarb	Avant	Dupont		Walnuts	Husk maggot, codling moth, Plum curculio			P			X	X	X		X		X	Only azinphosmethyl currently reg. English and Japanese walnuts showing good potential industry.
5	Thiamethoxam Priority #3	Actara, Cruiser,	Novartis		Tree nuts	Leaf hopper, Plum curculio, aphids.			P	X		X		X		X		X	
6	Pyriproxifen	Distance, Knack, Esteem	Valent		Walnuts	Codling moth			P			X		X		X		X	
Fungicides																			
1	Chlorothalanil	Bravo	Zeneca		Hazelnut/ Filbert	Eastern filbert blight	✓	✓	P			X		X		X		X	Also seeking resistant cultivars. Several Oregon and BC cv on trial.
2																			
3																			
4																			
5																			

Justification Reasons:

- No pesticide registered to control this pest.
- New introduced pest problem
- New crop program
- Resistance management tool
- EBDC fungicide replacement or OP insecticide replacement.
- More effective therefore pesticide reduction
- Reduce risk product or support new IPM approach - i.e. Predictive models, pheromone control program
- Export crop: need to harmonize pest control options or establish a crop tolerance.

Registration Status: IR 4 Codes: **I** means In-Progress; **C** completed and submitted to EPA; **P** means proposed but not approved or started yet.

APICULTURE & POLLINATION

APICULTURE ISSUES

ISSUE 1: Development of Detection Strategy and Management Protocol for the Small Hive Beetle, *Aethina tumida*. The Small hive beetle has invaded bee colonies in Florida and several other states in the US including NY and Michigan. This beetle has killed more than 30,000 colonies in the US and has become a serious pest in bee colonies and honey houses. In the US, CheckMite™ (Coumaphos) strips are used under section 18 to control the small hive beetles in bee colonies. Guard Star® (Permethrin) is used for soil treatment to kill pupating small hive beetles. The concern of Ontario beekeepers is that infected bee colonies are across the border within bee flying distance. Another concern is that CheckMite™ strips and Guard Star® are not registered for use in honey bee colonies in Canada. This is a serious threat to the beekeeping industry in Ontario. Studies should be initiated to develop a detection method to monitor the spread of the small hive beetles. The potential damage that can be caused by the Small hive beetle in Ontario needs to be assessed. Development of control measures that fit into the beekeeping management practices to control the Small hive beetle is essential to protect the beekeeping industry. This issue should be addressed as soon as possible to avoid any major damage to bee colonies. Thus, beekeepers will be able to provide farmers with the necessary honey bees for crop pollination.

Research Inventory: The OBA would like to direct some resources to Dr. Medhat Nasr to develop efficient and reliable detection methods for the small hive beetle, assess the potential damage, develop management techniques to control the beetles and disseminate this information to beekeepers.

Gaps/Barriers/opportunities: Financial resources and laboratory space to conduct the research are needed. We have highly trained personnel who have experience in the development of IPM programs related to apiculture. Apiaries infected by the small hive beetles are located in New York State close to the border. This research can be carried out in NY to develop solutions before the beetle arrives in Ontario. Thus, beekeepers will be able to monitor the spread of the beetles and control them if needed.

ISSUE 2: Development of Varroa Mite-Resistant Bee Stocks Using Different Selection Approaches and Integrating Resistance into Ontario Tracheal Mite-Resistant Existing Bee Stocks. Varroa mites continue to be a major concern. These mites can annually kill 50-70% of bee colonies if infested colonies are not treated. Breeding bees resistant to varroa is the long term solution to this problem. Research has shown that hygienic behaviour, grooming behaviour, and low mite reproduction are important natural traits possessed by honey bees for varroa control. We need to continue the selection program for breeding these traits into Ontario tracheal mite-resistant bees to reduce the effect of Varroa in Ontario. Thus, Ontario bee stocks will be resistant to both mites and beekeepers will gain the benefits of using these bees in the IPM program.

Research Inventory: Both of these items have been part of the OBA Tech Transfer Program and need to remain as priority items. Projects were initiated to bring bee stock from France and

the Russian stock from the USA. Both need to continue. In order to increase the genetic base for varroa resistance, it is proposed to bring more varroa resistant Russian Stock and Harbo's stock from the USA.

Gap/Barriers/Opportunities: The development of resistant stocks to mites is tedious and expensive process. It requires a long period of time for selection, development and implementation. In the USA, there have been two programs conducted by Dr. Rinderer and Harbo at the USDA laboratory to develop varroa resistant bees. These stocks have been released in the USA for use by beekeepers. We have personnel who are trained to use the instrumental insemination technique in breeding. This allows the use genetic materials (eggs and semen) without bringing any other possible pests and diseases. To conduct this research more resources should be mobilized to conduct this project. Thus, we can take advantage of this progress by importing eggs and semen from these stocks to Ontario. This project will make the development of resistant stocks less expensive since the USA researchers have done the initial research.

ISSUE 3: Further Development of an Effective Integrated Pest Management (IPM) Program for Controlling Parasitic Mites and Infectious Diseases of Honey Bees. Apistan® currently is effective on varroa mites in Ontario. The continuous use of Apistan® on varroa will lead to the development of resistance. Development of new miticides to be alternated with Apistan® will help to reduce the emergence of resistance to Apistan®. We have developed an effective single application method for Formic Acid to be used in rotation with Apistan®. However, Apistan® is nearing the end of life expectancy. Therefore, we need to find a replacement strategy for Apistan®. If possible it would be good to develop other "softer" chemical controls that work in Ontario ie. oxalic acid or non chemical methods like screened bottom boards.

Terramycin resistant strains of American Foulbrood have been found in parts of Canada on a large scale. It has not been found yet in Ontario. There is a need to develop an IPM strategy to deal with AFB.

Research Inventory: This IPM program for varroa and tracheal mites has been part of the OBA Tech Transfer Program. The development of the IPM component for AFB is new addition to the exciting program. Therefore, the IPM program remains as an important priority issue. Co-ordination between the OBA and the U of G needs to be continued to avoid any overlap and streamline research and development efforts.

Gap/Barriers/Opportunities: Recent research by the OBA Tech-Transfer program has shown that oxalic acid is a promising chemical to be used for varroa control. More research is needed to study the side effects on bees and to try to register this product to use in honey bee colonies. Other tools can also be evaluated against mites. This is a long term project that requires facilities and financial resources.

ISSUE 4: Quality of Hive Products to Meet Consumers Expectations. The continuous use of miticides and antibiotics in bee colonies increases the risk of contaminating the hive products (honey, wax, propolis) with residues. If the residues exceed the allowed limits the products cannot be marketed. Monitoring residues in hive products needs to continue to ensure high

quality and no contaminants as expected by the consumers.

Research Inventory: The OBA addressed this issue in 1999-2000. 85 samples were analyzed in Germany. The University of Guelph Lab services have the personnel and expertise to do this kind of analysis.

Gap/Barriers/Opportunities: The cost of sample analysis is very high although this issue is an important issue for food safety and quality. More resources need to be allocated for monitoring program to ensure food quality. Finding any residues will effect marketing of hive products. It also can be a concern for consumers.

ISSUE 5: Maintenance of the Apicultural Regulatory and Extension Programs in Ontario. The Apicultural Regulatory and Extension Programs have played an important role in the beekeeping industry in Ontario. New parasites, new pests and the possibility of resistant AFB are important issues which could seriously affect the beekeeping industry. Inspection and monitoring of diseases and pests have become very important in implementing the IPM program in areas where it is needed. Educating beekeepers about new developed techniques for management of bee diseases and pests remains critical across the province

Research Inventory: OMAFRA has a Provincial Apiarist and 22 part time bee inspectors. These personnel are deployed across the province to inspect, monitor, and educate beekeepers.

Gap/Barriers/Opportunities: With the finding of new pests and diseases just across the US border, the Apiculture regulatory and extension program has become very important to the beekeeping industry. This team has tremendous experience in sampling and monitoring pests and diseases. Continuing this program will help to maintain the industry ahead of the potential problems.

ISSUE 6: Registration of CheckMite™ (Coumaphos). This pesticide is the only registered product for controlling the small hive beetle in the world. It is also effective against varroa. So far, we have only Apistan used for varroa control. It is expected that varroa mites will be resistant to this miticides in near future. We support registration of CheckMite™ to have in place an alternate control the SHB and varroa in Canada.

Research Inventory: The PMRA regulates the registration of pesticides used in Canada. Bayer is the producer of CheckMite™ and they are working on registration.

Gap/Barriers/Opportunities: CheckMite™ (Coumaphos) is an Organo-Posphate (OP) pesticide. Registration of CheckMite™ may face problems because OP pesticides are under review by the PMRA. Beekeepers have some concerns about this product but this is the only products registered in the world to control the Small hive beetle. We encourage finding a safer, friendlier product to be used for the small hive beetle but until such product is found, we request support for the registration of CheckMite™.

ISSUE 7: Federal Registration of Formic Acid Mite-Away. This product can be used under the current exemption of formic acid as allowed by the PMRA. A full registration would be more

desirable. We support the full registration of Mite-Away.

Research Inventory: The OBA Tech-transfer specialist has developed of the Formic Acid Mite-Away pad.

Gap/Barriers/Opportunities: Beekeepers have been using Mite-Away for tracheal and varroa mites control. The use of the pads is covered under the PMRA memorandum for use of formic acid in bee colonies in Canada. NOD Apiary products is pursuing the full registration of this product. The beekeeping industry supports the full registration of this product to be added to the approved tools for the IPM program.

ISSUE 8: Monitoring for Varroa Resistance to Apistan®. The development of resistance to Apistan® by varroa mites is expected. Continuous monitoring of the efficacy of Apistan® and resistance by mites is a very important issue. Beekeepers would not like to be surprised by the fact that varroa has survived the treatment and killed their colonies.

Research Inventory: The OBA Tech-Transfer program has been monitoring resistance across Ontario. The Apicultural Regulatory and Extension Programs in Ontario are involved in the monitoring process.

Gap/Barriers/Opportunities: the USA beekeepers were taken by surprise when mites developed resistance to Apistan®. They lost thousands of bee colonies because Apistan® did not kill resistant varroa mites. In Ontario, early detection and continuous monitoring of varroa resistant to Apistan® is important. We can avoid the loss of bees by using other methods to control mites. Since we have only formic acid and Apistan®, it is important to monitor resistance. Resources and laboratory space are necessary for working on this issue.

ISSUE 9: Development of a Marketing Strategy for Honey to Replace Imports. Honey prices are at low levels. The world market and dumped honey from other countries keep the prices very low. In addition, the current label on honey is not clear. It shows the Canadian Grade for any honey regardless the source of honey. This is confusing and misleading to consumers. A clearer label with clear statement about source of honey and grading is required to help development of local markets for Canadian produced honey. Added value products are very important to improve returns to beekeepers. This will help the beekeeping industry maintain bee colonies. Thus, they can provide these colonies for pollination and maintain competitive prices for pollination services.

Research Inventory: The OMAFRA marketing specialists, the Provincial Apiarist, and the OBA have the personnel to conduct some research on this issue. The federal government Honey Program can also mobilize some resources to open markets for Canadian Honey and protect farmers from unfair trade competitions.

Gap/Barriers/Opportunities: More research and regulations are needed to make sure the labeling of honey is clear to consumers. If honey is produced in Canada the labels should be clear to the consumers. Presently, the label is not clear. The current label shows the Canadian Grade for any honey regardless the source of honey. This is confusing and misleads consumers.

We can improve our marketing by making clearer labels and promoting Canadian honey.

POLLINATION ISSUES

ISSUE 1: Management Strategy for Machine Harvested Cucumbers. Cucumber is a crop grown in south western Ontario. Large acreages have been grown every year. The pollination requirements are not well defined. To ensure high quality crop, pollination is needed. Studying factors affecting pollination efficacy and requirements is needed to serve both cucumber growers and beekeepers.

Research Inventory: the University of Guelph, Pollination laboratory has the trained expertise in the field of pollination ecology and biodiversity. So far, research has been sponsored by the cucumber growers and beekeepers to solve this issue.

Gap/Barriers/Opportunities: More research funds need to be allocated to conduct the necessary research. The OMAFRA research program at the University of Guelph can focus on providing some resources to study this problem. Any increase in cucumber pollination will help increase the cash return to beekeepers and growers.

ISSUE 2: Pollination Requirements of New Varieties of Apples. Feral honey bees have been exterminated by mites. This part of the pollinator force available for crops has disappeared. Wild bee populations have also been extensively reduced. High density apple orchards are annually increasing. Therefore, the apple pollination requirements should be reevaluated. Examination of genotypes of apple seeds in ripe fruit to map and quantify the extent of gene and pollen movement in orchards are needed.

Research Inventory: the University of Guelph, Pollination laboratory has been working on this issue.

Gap/Barriers/Opportunities: Financial support from the industry and the OMAFRA program at the U of G are needed. The OMAFRA research program at the University of Guelph stopped their support in 1999-2000. This may have detrimental effects on research on this area.

ISSUE 3: Produce a Best Management Practice Strategy for Pollination Management. Pollinators require efficient management protocols. These management practices help to mobilize strong healthy bee colonies for pollination. These pollinators also need protection from pesticides when they are pollinating plants.

Research Inventory: the University of Guelph, Pollination laboratory has been working on this issue.

Gap/Barriers/Opportunities: Financial support from the industry and the OMAFRA program at the U of G are needed. This may have detrimental effects on research on this area.

APPLE

1. Evaluate the performance and marketing potential of new and advanced apple selections for Ontario

The Issue

The industry, as well as packers and retailers, are optimistic in regards to new cultivars and their potential economic benefits in the marketplace. However, the industry must move towards quickly evaluating new cultivars in order to:

- Assess their suitability for the wide range of Ontario growing conditions (climate)
- Determine production problems and limitations such as biennial bearing, inconsistent cropping, tree growth habits, thinning requirements, response to irrigation, fruit characteristics and fruit quality and physiological disorders, and harvesting and handling procedures.
- Create proper harvest maturity criteria (starch guides), ground colour requirements, etc.
- Develop controlled atmosphere recommendations.
- Standardize evaluation for consumer and retail acceptance tests

Current Research and Extension Activities

There are three research and extension efforts presently underway in Ontario that focus on new and advanced apple cultivar selections. John Cline at the University of Guelph, Simcoe Campus is an active participant in the USDA Co-operative Apple Cultivar Project called NE-183. The primary purpose of this project is to determine which cultivars, from presently 50 under study, are most precocious, have superior quality attributes such as taste, texture, firmness, and storage potential, and which are 'grower friendly' to manage. Research colleagues in the United States are also identifying which cultivars are least susceptible to insects, fungal and bacterial injury-information. Involvement in this project allows Ontario access to new and advanced selections that would be difficult to acquire otherwise for research purposes. It also provides access to the database of independent assessment conducted by other pomologists.

The second effort at the University of Guelph, Simcoe, in cooperation with John Zandstra, University of Guelph, Ridgeway College, Ken Wilson, OMAFRA, Clarksburg, and Dr. Cheryl Hampson, AAFC, PARC, Summerland, is to evaluate advanced selections from the PARC apple breeding program, Summerland. Presently, there are two trials established in each of the four locations. The trials consist of randomized and replicated designs to determine the genetic and environmental factors that influence tree growth, yield, fruit quality, among many other commercially important attributes. It also provides Ontario growers an objective assessment of the suitability of advanced selections under our growing conditions, which were bred and selected primarily for the Okanagan.

Ken Wilson, OMAFRA, is leading the extension efforts on regional testing of named cultivars. This is a joint project with OFTA and The Apple Growers of Ontario. In the spring of 2000, the following cultivars were planted in and non statistical fashion in several (8-10) locations across Ontario: Abrosia, Cameo, Chinook, Creston, Enterprise, Gingergold, Gold Rush, Honeycrisp, and Silken (see

<http://www.gov.on.ca/OMAFRA/english/crops/hort/news/orchnews/2000/on0100.htm> for more

detail). This primary objective of this project is to demonstrate newly released cultivars to growers and to determine their suitability (approximate harvest date) in each of the major growing regions in Ontario. As this is not a research project, yield, tree growth, and fruit quality information will not be collated from across the sites.

Gaps/Barriers/Deficiencies

The apple industry and consumers are interested in new cultivars. Presently, there are several deficiencies in research and extension that do not allow the Ontario apple industry to take full advantage of this new interest and demand. This is primarily a result of inadequate provincial and federal government/matching funding through CanAdapt, Healthy Futures, or similar programs, despite the apple industry having allocated financial support towards such research in recent proposal submissions.

The apple industry needs to have in place adequate research and development programs to address all the points indicated above as they relate to new apple cultivars. To do this financial support through grant programs, such as Healthy Futures, must be made available to the industry.

2.P Post-Harvest Strategies to Improve Apple Fruit Quality

The Issue

Consumers now recognize that freshness and flavour are major constituents of product quality, and that the firmness of the apple fruit best characterizes freshness. The industry needs to examine all the factors that can affect apple firmness from orchard practices right through storage to transport to market.

Other storage problems include storage rots of apples, which can lead to significant losses and superficial scald, a chilling-like physiological disorder that develops during cold storage, leading to considerable wastage.

Current Research/Extension Activities

Work at the University of Guelph (Guelph and Vineland Campus) is focussed on retaining as much as possible of the 'at harvest' flesh firmness and are using some of the new or developing technologies such as pre-harvest ReTain application and post-harvest application of 1-methylcyclopropene (1-MCP; EthylBloc) to achieve this goal. Other work involves managing superficial scald and other storage disorders.

Gaps/Barriers/Deficiencies

The above research also needs to emphasize the interaction of these technologies with current handling and storage practices (e.g., fruit precooling rate, CA storage, etc.), and should be expanded to include research using newer strategies such as 'initial low oxygen stress' (ILOS), 'ultra low oxygen' (ULO), and 'programmed CA' (PCA) as potential storage components with positive impacts on fruit firmness retention and quality. These efforts would benefit the handling and marketing practices of cultivars such as Empire, McIntosh, Gala, Fuji, Cortland, Jonagold, etc. in which freshness and firmness are integral aspects of market quality.

Current research on biological control of post-harvest fungal rots of apples has demonstrated significant reduction in disease incidence. Work on the efficacy of current and potential new fungicide technologies and biological control agents needs to continue, and should be expanded to investigate the potential for synergism/antagonism of these technologies with application of jasmonic acid derivatives, 1-MCP, and/or low oxygen CA stress.

Low oxygen controlled atmosphere (CA) storage reduces scald incidence. Research needs to continue on low oxygen (ULO, ILOS) and other non-chemical alternatives as a means to prevent scald, particularly on apples which are not placed in CA storage. The potential benefits of application of ReTain (to delay harvest maturity and to cold-acclimate fruit in the orchard) and/or 1-MCP, and their synergy with low oxygen CA systems, on reducing scald in sensitive cultivars needs to be determined.

3. Integrated Management of Apple Diseases

The Issue

Apple scab is the most important disease of apple in Ontario, and the potential crop loss from this disease can be up to 100%. Currently the control of apple scab is achieved with multiple applications of fungicides. However, this control strategy is expensive, limited by the development of fungicide resistance and discouraged by public perceptions on food safety and concern for environmental impacts. In addition, the control of apple scab with newer, more narrow spectrum fungicides, such as strobilurins and sterol inhibitors, can result in epidemics of other foliar or fruit diseases, including black-rot, flyspeck and sooty blotch.

To reduce the fungicide use for apple scab control, to delay the development of fungicide resistance and to suppress other foliar and fruit diseases, an improved management strategy is urgently needed. This can be achieved by integrating fungicide applications with cultural and biological approaches, along with use of improved scab prediction systems.

With the use of the newer fungicide families mentioned above there is a greater risk of fungicide resistance developing in apple scab populations. This has already occurred in some European countries and in the United States. The need for rapid assay techniques for fungicide resistance are paramount in early detection in Ontario orchards.

Current Research and Extension Activities

The Fruit Pathologist with University of Guelph, Vineland began work on Fall urea applications for apple scab control and on fungicide resistance assay methods, but has since left the system. The Research Pathologist at AAFC, Vineland has also been involved in surveying for resistance to common fungicides used to manage scab, but is retiring in February 2001.

The Pome Fruit IPM Specialist with OMAFRA continues to develop disease management strategies for the industry but has been affected in the breadth of trialing new materials by the loss of Regional Crop Specialists from OMAFRA.

Gaps/Barriers/Deficiencies

- With the slated retirement of the Research Pathologist at Vineland there is a huge hole

left in tree fruit pathology research in the province of Ontario.

- There is no current funding available for the Pome Fruit IPM Specialist to conduct province-wide fungicide field trials or to set up demonstration sites.
- The PMRA's registration process has hampered the rapid registration of newer, IPM-friendly fungicides – products which American apple growers have access to and, therefore, have competitive advantages over the Ontario industry.

4.Tree Mortality Factors: Fire Blight and Dogwood Borer

The Issue

The movement of the apple industry to more dwarfing rootstocks has meant added risks from fire blight, a bacterial disease, and dogwood borer, a moth pest. Fire blight has always been a major concern for apple growers and in epidemic years (eg. 1991) hundreds of acres of orchards may have to be removed. The disease is even more devastating when it comes to dwarfing rootstocks since the rootstock itself is highly susceptible. Dogwood borer injury has become more prevalent in Ontario apple orchards in the last 10 years and is directly correlated with increased plantings of dwarfing rootstocks. Infestations can weaken trees, making them more susceptible to winter injury, drought, etc. Tree deaths have been recorded in several orchards and a 2000 survey showed the pest present in almost 100% of high density orchards.

The most economically significant impact of these pests is that they can result in tree deaths which means the loss of multiple production years for producers.

Current Research and Extension Activities

There is currently little research being conducted on management of these pests. OMAFRA is conducting several mating disruption trials for dogwood borer in southern Ontario.

Gaps/Needs/Barriers

Currently only Streptomycin is registered for control of fire blight and Pounce, a pyrethroid, is registered for control of dogwood borer. Newer chemistries and non-chemical alternatives are required to better manage these pests and avoid the development of pesticide resistance to currently registered products. Apogee and BlightBan, both registered in the U.S., need to be registered in Canada. Mating disruption for management of dogwood borer is a successful strategy in the U.S. – the technology needs to be registered in Canada.

5.De velopment of Specific Cultural Practices for High Density Apple Plantings

The Issue

Primary production research of apples, particularly for newer higher density plantings, remains a high priority for this committee. This research includes, but is not limited to, crop load management (fruit thinning), pollination, weed control, tree fruit nutrition, irrigation and moisture management, soil management, rootstock research and development, orchard systems, and plant growth regulators to influence plant growth and development. Since its inception in the mid 1960s, The Horticulture Research Institute of Ontario, Simcoe (now the University of Guelph, Simcoe Campus) has been a world recognized leader on the cultural management research of apples. The future viability and sustainability of the Ontario apple industry is

dependent upon basic and applied research to address the short and long-term needs of the industry.

Current Research and Extension Activities

Most cultural management research on apples is presently being conducted almost exclusively by Dr. John Cline at the University of Guelph, Simcoe. Presently, John has approximately fifty short- and long-projects in progress. Many do not qualify for financial support by OMAFRA's special research funds because they do not fall within the objectives of the funding criteria, even though many of the projects are leading concerns of the industry and have been highlighted as OASCC priorities. This has forced many existing and potentially new cultural management research projects to be either discontinued or only considered with private industry support. Many such supported projects pertain to short-term issues, leaving long term strategic research (ie, orchard sustainability, rootstock research and development, tree fruit physiology) unsupported.

Gaps/Barriers/Deficiencies

Financial support for Dr. Cline's research is urgently required to continue and initiate essential and critical long-term research on cultural management practices for Ontario apples.

6. Development of Advanced IPM Program for Apples

The Issue

The Ontario apple industry has always been recognized as a leader in the development and commercial adoption of IPM technology. Faced with today's economic and environmental challenges it has the opportunity to continue to be at the forefront in the further modification and improvement of integrated pest management technology.

An Advanced IPM Program has the potential to be used as a positive public relations tool to indicate to the general public, media sources and environmental groups, the efforts the Ontario apple industry is putting into sustainable farming and reducing environmental impacts of farm practices.

Research and Extension Activities

The Pome Fruit IPM Specialist with OMAFRA has developed protocols for implementing an Advanced IPM program for an extensive demonstration trial in several commercial apple orchards in Ontario.

Gaps/Barriers/Deficiencies:

The Triad proposal, submitted by the Apple Growers of Ontario to Healthy Futures, had a significant component dedicated to developing an Advanced IPM program for Ontario apple growers. Widespread industry support and financial support from the World Wildlife Fund strengthened the partnership component of this proposal. Approval of this proposal (resubmitted in December 2000) would allow the advancement of this important project.

Gaps/ Barriers/Deficiencies

- Key components that need to be addressed by establishing several commercial demonstration sites are:
- Testing of newer IPM-compatible pesticides and pesticide alternatives (eg. Pheromone mating disruption) and their fit in the Advanced IPM program
- Development and testing of environmental impact indices to compare Advanced IPM with less sustainable programs
- assess efficacy of predator mites as biological control agents and fit in an Advanced IPM program
- To determine the effect of post-harvest flail mowing of leaf litter and other non-pesticide techniques to reduce fungicide use
- Developing an integrated weed management strategy including the feasibility of using alternatives to herbicides and developing recommendations for timing and use of low persistence, low leaching potential herbicides
- Develop marketing strategies for Ontario apples using IPM as the marketing tool

7. Sustainable Management Practices for Obliquebanded Leafroller

The Issue

The obliquebanded leafroller has become resistant to organophosphate insecticides in several large apple growing areas in Ontario (50% of growing area).

Current Research and Activities

An interim strategy was developed by OMAFRA, which includes monitoring methods, degree day modelling predictions and use of B.t and Confirm to manage the pest. A large research initiative by AAFC (\$600,000 over 3 years) was initiated in 2000 to study the following: 1) determination of cross-resistance occurrence; 2) appropriate trap selection; 3) assessment of resistance management strategies and development of rapid assay techniques to monitor resistance in the field; and 4) assessment of mating disruption management strategies.

Gaps/Barriers/Deficiencies

Several new insecticides with efficacy on OBLR will be registered in the next few years. These materials must be tested under field conditions to assess their effectiveness and their fit in IPM programs.

8. Develop Management Techniques for European Apple Sawfly

The Issue

European apple sawfly (EAS), an introduced direct pest of apple has been moving slowly eastward across Ontario over the past 10 years. Up until 1998, controls for EAS were warranted only in the Ottawa Valley and Brockville. In 1998, EAS damage was found north and west of Kingston and in 1999, damage was found in the Waupoos area of Prince Edward County. In the spring of 2000, trap catches of EAS adults in Waupoos were high and growers were advised to apply controls for the pest. Harvest assessments in 2000 west of Waupoos did not detect EAS damage.

Current Research and Activities

None

Gaps/Barriers/Deficiencies

Monitoring of EAS needs to be maintained as its spread west to other apple producing areas is inevitable.

OP insecticides control EAS – only azinphos-methyl is currently registered. Alternative controls such as beneficial nematodes or fungi and IPM friendly insecticides need to be investigated as replacements to OP insecticides.

MINOR USE PESTICIDE REGISTRATION WISH LIST TO OHRSCC & OPMRSC

Subcommittee: Apple Research and Services Subcommittee of OHRSCC Submitted by: Bernt Solymar, Chair

Overall Rating	Chemical Name	Brand Name	Company	Crop	Registration Status			Justification							
					CDN	USA	IR4	1	2	3	4	5	6	7	8
Insecticides and Acaricides															
1	Greater peach tree borer pheromone (mating disruption)	Isomate P	ShinEtsu	Apple	Dogwood Borer	x							x		Current registered material (pyrethroid) not effective enough
2	Obliquebanded leafroller pheromone (mating disruption)		3M Corporation	Apple	OBLR	x				x		x		x	Organophosphate resistance occurs in Ontario
3	indoxacarb	Avaunt	Dupont	Apple	Plum curculio, apple maggot, codling moth	Expected in 2000				x		x		x	
4	bifenazote	Acramite	Uniroyal	Apple	Spider Mites						x			x	
5	kaolin clay	Surround	Engelhard	Apple	Plum curculio, apple maggot, leafrollers, codling moth					x		x		x	
Fungicides/Bactericides															
1	Prohexidione-Ca	Apogee	BASF	Apple	Fire blight	x							x	x	
2	Pseudomonas fluorescens A506	Blightban	Plant Health Technologies	Apple	Fire blight	x							x	x	
3															
4															
5															

Justification Reasons:

1. No pesticide registered to control this pest.
2. New introduced pest problem
3. New crop.
4. EBDC fungicide replacement or OP insecticide replacement.
5. Resistance management tool
6. More effective therefore pesticide reduction.
7. Reduce risk product or support new IPM approach ie. Predictive models, pheromone control program
8. Export crop: need to harmonize pest control options or establish a crop tolerance.

Registration Status:

IR 4 Codes: I means In-Progress; C- completed and submitted to EPA; P means proposed but not approved or started yet.

Overall Rating	Chemical Name	Brand Name	Company	Crop	Registration Status			Justification								
					CDN	USA	IR4	1	2	3	4	5	6	7	8	Other
Herbicides																
1	azafenidin	Milestone	Dupont	Apple			x						x			
2	Collettrichium spp.	Mallet	Encore Technologies	Apple				x						x		
3																
4																
5																
Plant Growth Regulators																
1	1-MCP	EthylBloc	Rohm and Haas	Apple												Ethylene inhibitor enhances storage life of store fruit and reduces scald incidence
2	Prohexidione-Ca	Apogee	BASF	Apple			x						x		x	Reduces excessive vegetative growth and reduces incidence of fire blight.
3																
4																
5																

Justification Reasons:

1. No herbicide/plant growth regulator registered to control this pest or manipulate the crop.
2. New introduced or opportunistic weed.
3. New crop.
4. Loss of older herbicides.
5. Resistance management tool
6. More effective product therefore pesticide reduction.
7. Support new IPM approach ie. Predictive models or weed threshold
8. Export crop: need to harmonize pest control options or establish a crop tolerance.

Registration Status:

IR 4 Codes: I means In-Progress; C- completed and submitted to EPA; P means proposed but not approved or started yet.

BERRY CROPS

Research Priorities

1. **Breeding new berry crop cultivars:**
 - Breed new June-bearing strawberry cultivars with firm fruit and long shelf-life for the fresh market. Strawberry cultivars, including dayneutrals, are needed in a wide range of maturities, especially for the late and early seasons.
 - Breed new raspberry cultivars with improved fruit quality, disease resistance and winter hardiness.
2. **Develop sustainable crop production systems with emphasis on disease, insect and weed control strategies, and alternatives to soil fumigants:**
 - Develop integrated weed control strategies for reduced pesticide use and crop losses in strawberries and raspberries.
 - Evaluate provincial recommendations for macro- and micro-nutrients for strawberries, with the first priority being the uptake and removal of nitrogen and then phosphorous.
 - Develop year-round cropping systems for strawberries and raspberries including greenhouse production, plasticulture, dayneutrals, etc.
 - Develop integrated control systems for raspberry cane diseases and fruit rots including chemical and biological control systems.
 - Develop integrated pest management schemes for reduced pesticide use and crop losses in strawberries. Investigate methods of controlling tarnished plant bug.
 - Determine the epidemiology of anthracnose fruit rot in Ontario and develop integrated management options.
 - Develop virus detection methods and determine the incidence in strawberries and raspberries in Ontario
 - Develop biological mite control strategies for raspberries.
 - Determine economic thresholds for the control of foliar diseases of strawberries (ie leaf scorch, leaf blight and powdery mildew).
 - Develop effective, cost-efficient bird control strategies for blueberries.
3. Examine physiological and economic potential of new or non-commercial berry crops.

Service Priorities

1. Technology transfer of sustainable crop production systems for berry crops including integrated pest management, food safety and crop nutrition. Sustainable berry production systems need to remain competitive, profitable and environmentally acceptable. Research and technology from around the world must be adapted to meet the needs of Ontario growers under Ontario conditions.

Access to the unbiased expertise of extension personnel remains a critical issue. Two-way communication with growers and others in the berry industry through agriphones, newsletters,

the internet, presentations, farm calls and individual contact is essential to transfer current technology and information.

2. Rapid diagnostic disease service using DNA-based PCR techniques. Techniques are becoming available for rapid diagnosis of crop diseases. It is essential to the crop industry that these techniques be available at a reasonable cost with a quick turn-around time. Coordination between all parties who will benefit from this type of service is necessary to move this technique from the research lab to the diagnostic lab.

3. Maintain support of the berry crop propagation program including the SPUD Unit. Although the OBGAs finance and manage the plant propagation program, University of Guelph and AAFC researchers provide essential support to the program. Adam Dale continues to provide expert support to the Ontario plant propagation program and the ACHENE Committee. Becky Hughes and Margie Luffman provide technical expertise and Nuclear disease-tested plant material for the program. The Genebank works with the OBGAs, virus testing and propagating strawberry and raspberry cultivars. Micropropagated strawberry plants from the SPUD Unit in New Liskeard form the foundation of the strawberry plant propagation program.

The research funding provided by the OBGAs annually is derived from this program. It is essential to the program that the researchers involved continue to provide technical expertise, and that the Genebank and the SPUD Unit maintain and produce Nuclear stock.

4. Minor-use pesticide registrations for berry crops. Minor-use registrations are needed to maintain a competitive toolbox against pests in berry crops. Many registrations in berry crops are old and likely to be cancelled as FQPA takes effect. While new products are being registered in Canada for crops with large acreages (ie field crops), there are few new registrations for high-value, low-acreage crops such as berries.

A number of minor-use registration requests are in the system at present. These represent some of the highest priorities for the industry. However, they are not the only priorities. Time constraints on OMAFRA extension staff limit the number of registration requests in the system at any one time.

The 2000-2001 Minor Use Registration priorities of this committee were submitted to the OHCRSC and the OPMRSC.

MINOR USE PESTICIDE REGISTRATION WISH LIST TO OHRSCC & OPMRSC

Subcommittee: Berry Crops Submitted by: Pam Fisher and Leslie Huffman

Overall Rating	Chemical Name	Brand Name	Company	Crop	Registration Status			Justification							
					CDN	USA	IR4	1	2	3	4	5	6	7	8
Example	imadacloprid	Admire	Bayer	Grape	✓	✓	C	✓			X		X	X	X
Insecticides and Acaracides															
1	imadacloprid	Admire	Bayer	Blueberry Strawberry Raspberry	White grubs and other general pests	•	•	•	•						Scarab & chafer pests expanding range
2	bifenthrin	Brigade	FMC	Raspberry Strawberry Currant	Tarnished plant bug Root weevils General raspberry & currant pests		•	•							Need a low dth for TPB on day-neutral strawberries
3	esfenvalerate	Asana	Dupont	Raspberry Strawberry Currant	Tarnished plant bug Root weevils General raspberry & currant pests		•								Need a low dth for TPB on day-neutral strawberries
4	thiomethoxozm	Actara	Novartis	Blueberry Strawberry Raspberry	White grubs and other general pests			•	•						Scarab & chafer pests expanding range
5	cyhalothrin lambda	Matador	Zeneca	Raspberry Strawberry Currant	Tarnished plant bug Root weevils General raspberry & currant pests	•		•	•						Need a low dth for TPB on day-neutral strawberries

Fungicides		Quadris	Azoxystrobin	Zeneca	Strawberries, raspberries, blueberries	anthracnose	*	*	I							Registered on strawberries in SE states
1																
2		Nova	Myclobutanil	Rohm and Haas	Strawberries, raspberries, currants, gooseberries	Powdery mildew	*	*	I							Registered on strawberries in SE states
3		Switch	Cyprodinil + fludioxinil	Novartis	Strawberries, raspberries, blueberries	Botrytis			I							
4		BAS 516 or BASF 500	Cabrio	BASF	Strawberries, raspberries, blueberries	Anthracnose, botrytis			I							Pending registration in USA
5		Topas	Propiconazole	Engage Agro	Currant, raspberry	rust	*	*								
6		Elevate	fenhexamid	Tomen Agro	Raspberry	botrytis	*	*								Currently in minor use system

Justification Reasons:

1. No pesticide registered to control this pest.
2. New introduced pest problem
3. New crop.
4. EBDC fungicide replacement or OP insecticide replacement.
5. Resistance management tool
6. More effective therefore pesticide reduction.
7. N:\data\pam\wish list
8. Reduce risk product or support new IPM approach ie. Predictive models, pheromone control program
9. Export crop: need to harmonize pest control options or establish a crop tolerance.

Registration Status:

IR 4 Codes: I means In-Progress; C- completed and submitted to EPA; P means proposed but not approved or started yet.

Overall Rating	Chemical Name	Brand Name	Company	Crop	Registration Status			Justification									
					CDN	USA	IR4	1	2	3	4	5	6	7	8	Other	
Example	imadacloprid	Admire	Bayer	Grape	✓	✓	C	X				X		X	X	X	New varieties planted more susceptible
				Grape and potato leafhoppers													
Herbicides																	
	s-metolachlor	Dual Magnum	Novartis	Strawberry	✓	✓	✓rasp						X				problem weed control
	terbacil	Sinbar	DuPont	Raspberry	✓	✓							X				crop tolerance
	napropamide	Devrinol	UAP	currants	✓	✓	✓curr	X									Need more effective herbicide.
	acifluorfen	Blazer	BASF	gooseberry	✓	✓	✓str tol	X									No preemergent herbicide registered.
	sulfentrazone	Authority	DuPont	strawberry	✓	✓	✓	X									No postemergent broadleaf registered.
				blueberry			✓										better crop tolerance esp for new plantings
				Strawberry													
Plant Growth Regulators																	
	Iron phosphate	Sluggo	Neudorf	strawberries		*											
	Methyl anthrnilate	Avignon	Engage Agro	blueberries													

Justification Reasons:

1. No herbicide/plant growth regulator registered to control this pest or manipulate the crop.
2. New introduced or opportunistic weed.
3. New crop.
4. Loss of older herbicides.
5. Resistance management tool
6. More effective product therefore pesticide reduction.

7. Support new IPM approach ie. Predictive models or weed threshold
8. Export crop: need to harmonize pest control options or establish a crop tolerance.

Registration Status:

IR 4 Codes: I means In-Progress; C- completed and submitted to EPA; P means proposed but not approved or started yet.

CRUCIFER CROPS

Minor Use Priorities

1. BAS 516 for downy mildew and other diseases
2. Fulfill (pymetrozine) for aphids
3. Intrepid (methoxyfenozide) for Lepidopteran pests
4. Success (spinosad) as above
5. Regent/Canon (fipronil) seed treatment for cabbage maggot
6. Actara (thiamethoxam) for insects other than cabbage maggot
7. Aztec (cyfluthrin-phosphorothioate) for cabbage maggot
8. Proclaim (emamectin benzoate) for Lepidopteran pests
9. Agrimek (abamectin) for leafminers

Research and Service Priorities

1. Pursue minor use pest control product registrations for improved management of insects, diseases and weeds of crucifer crops, especially specialty crucifers which have a poor IPM toolkit. In light of the US FQPA and continuing lack of a 'level playing field' for Ontario growers, the registration of new, 'reduced-risk' active ingredients is also urgently needed. Increased cooperation with the US IR-4 program is strongly encouraged. In addition the need for GLP certification of the University of Guelph, Laboratory and AAFC field research stations is required for all minor use residue trials.

2.1 Investigate, develop and transfer practical pest control methods for cruciferous crops.

Group 1 (established pests) includes evaluation of plant species as trap crops for flea beetles, thrips, caterpillars and other insects; evaluation of varieties with resistance to pests; evaluation of biological controls and cultural practices for the control of various diseases and insects. Major diseases include clubroot, black rot, *Alternaria* and downy mildew. For cabbage maggot emphasis on developing a revised degree-day model, improving monitoring methods, developing registered seed treatments (fipronil, chlorpyrifos) and plug tray drenches. In light of the loss of Birlane and Furadan and reliance upon old organophosphates in RUTABAGAS, new and improved strategies are urgently needed.

Group 2 (new pests) includes evaluation of the biology and management strategies for swede midge and vegetable leafminers.

3. There is a need to investigate fertility practices for crucifer crops:

- A) special emphasis on an integrated fertility program which takes into better account the complete soil nutrition regime and nutrient management planning. Studies on crop uptake, crop removal, growth stage models and a revision of current recommendations are needed. A special focus on the needs of organic (muck) soils is also needed.

- B) Because soil-borne diseases (clubroot, *Rhizoctonia*, *Fusarium*) may be greatly affected by fertility practices, evaluation of disease management strategies should be an integral part of any fertility research.
4. Develop an improved black rot disease management strategy with emphasis on extension of known greenhouse management strategies and seed treatment technologies. Investigation of transplant treatments that may reduce the spread of black rot are also suggested.
 5. Continue to survey and identify diseases and pests of specialty crucifer crops with emphasis on detecting problems which may be a threat to traditional crucifer vegetables, including virus diseases and developing management strategies.
 6. Continue to evaluate cole crop varieties for suitability to Ontario growing conditions, storage conditions, market demand, pest/disease resistance with emphasis on plant spacing and yield evaluations.

Research Priorities Specifically Directed To Omafra's "Special Research Fund"

Category 1: Minor Use Projects: Top 3 as identified above.

Category 2: Pesticide Reduction and Safe Usage

Cabbage, Cauliflower & Broccoli:

- A. Evaluation of alternatives to pesticides for effective pest control which includes trap crops, biological controls, cultural practices, monitoring strategies, testing of reduced risk materials, resistant variety evaluations and amended use patterns.
- B. Evaluation of strategies that reduce diseases through fertility and cultural practices.

Rutabagas:

- A. Evaluation of strategies to reduce damage from cabbage maggot and to find alternatives to currently labeled organophosphate insecticides.

Specialty Crucifers:

- A. Evaluation of alternatives to pesticides for effective pest control which includes trap crops, biological controls, cultural practices, monitoring strategies, testing of reduced risk materials, resistant variety evaluations and amended use patterns.

Category 3: Emerging Pests

- A. Investigating the biology, distribution and potential management strategies for the swede midge.

- B. Investigating the biology, distribution and potential management strategies for the pea leafminer.

GINSENG

1. There is an increasing need to address a sound breeding program with a view to selection of commercially desirable strains. Minor technical "hurdles" remain in micropropagation techniques. Industry and research representative need to discuss future directions and the potential for grower remuneration for the sale of new selected strains.
2. There is a need to address the use of manure in ginseng gardens. Future nutrient management legislation will require that use be justified and necessary to production.
3. Growers need to develop a reliable means of evaluating the potential of research proposals that require grower funding, both for agronomic and medicinal research and a means of evaluating the research establishment.
4. Use of the product Quadris on ginseng for the control of *Rhizoctonia* must be made clear to growers especially in regards to timing of application. It will be essential this coming spring to get the product on gardens after the ground thaws and before the seeds begin to sprout.
5. There is an urgent need to find a product that controls *Cylindrocarpon*.

Urmule Priorities:

1. To pursue the URMULE for Quadris or request another emergency exemption
2. Maxim (seed treatment)
3. Chlorine (seed disinfectant)
4. Dividend (seed treatment)
5. Select (herbicide, cereals)

Research Priorities For 2001:

Pest Management Priorities

1. To determine the causes and evaluate control measures for Rusty Root.
The disease Rusty Root currently reduces root value and in some cases can limit yields in ginseng. Estimated losses can be as high as 75%. The causes of Rusty Root are unknown.
2. To screen products for the control of *Cylindrocarpon destructans* in ginseng.
Cylindrocarpon currently causes 10-50% losses in ginseng gardens. If three year gardens that exhibit *Cylindrocarpon* infection are left for the fourth year losses can be as high as 90%. There has been sufficient new chemistry on the market since the original work was done on this at the University of Guelph and AAFC Delhi in the 1980' and early 90's to warrant a new screening trial.

New Priorities

1. Clinical trial research to determine the effectiveness of Ontario ginseng root for the treatment of diabetes, high blood pressure and certain tumor-causing cancers. If ginseng is to be accepted in Western medicine it must be shown to be effective under clinical investigation. New Natural Health Products Regulations will demand that all newly

identified uses have supporting clinical data. If the Ontario ginseng industry pro-acts in the direction of this research it will be poised to enter the North American and European market as a product with identifiable benefits.

2. To make micropropagation a deliverable technology. Effective micropropagation techniques would allow the industry to take maximum advantage of the ginseng plant breeding program at AAFC. Without micropropagation the development of new strains would take 10 – 20 years to stabilize a single trait.
3. Germplasm development for the selection of specific characteristics. Existing and developing strains must be evaluated for the desirability of various characteristics. There needs to be a means of maintaining and screening germplasm for such evaluation.
4. Evaluation of the development of field resistance to Ridomil and other fungicides. Lack of disease control in a garden can result in 30-90% loss. In order to provide appropriate advice to growers and to maintain disease control it is necessary to determine whether field resistance has developed. A survey of ginseng pathogens associated with economic losses in gardens would benefit the industry.

Ongoing Priorities

1. To determine the crop removal numbers for N and P in Ontario ginseng. To determine the effectiveness of manure application to ginseng in the preplant year. Past evidence has indicated that manure is applied excessively in terms of nutrients to ginseng. It's affect on root shape, however, has not been explored and should be. There is some evidence that excess manure is associated with symptoms of Rusty Root.

GREENHOUSE AND PROTECTED CROPS

Greenhouse Vegetables

Research Priorities:

1. Evaluate new and old pest (thrips, whiteflies, lygus bugs) and disease control measures (including application methods) and implement IPM strategies for control of powdery mildew in cucumbers, tomatoes and peppers, Pythium root rot and Penicillium in cucumbers, and, Botrytis in all vegetables.

Develop and evaluate energy use and environmental strategies that optimize plant growth, productivity, and fruit quality, as well as integrated pest management techniques in greenhouse vegetables.

Maintain research on soilless culture with emphasis on recycling nutrient solutions and disease management to improve profitability and sustainability.

Develop strategies to manage greenhouse waste (growing media, plant material, nutrient solution, plastic etc.) and to ensure the sustainability of the greenhouse industry.

Evaluate new types of crops, cultivars, and post-harvest technology procedures (including packaging and labelling) to optimize yield and fruit quality.

Mushrooms

Commercial Mushrooms – Long term priorities (2 to 4 years duration)

The working group established the following as long term priorities:

- Compost odor management
- Influence of mushroom farming practices on surface and underground water
- Improvement of mushroom quality
- Enhancement of value to mushrooms, eg nutraceuticals
- Management of pesticide resistance
- Management of energy and labour

Specialty Mushrooms – Long term priorities (2 to 4 years duration)

The working group did not come to a consensus which reflects the diverse needs of this fledgling industry. However, the comments, coupled together with the concerns and short term priorities, suggest a need to develop a better marketing strategy and retail presentation.

Commercial Mushrooms – Short term priorities (within two years)

Insect and Disease

- Determine the effectiveness of fungicides, fungi static materials and barrier techniques to manage *Trichoderma* green mould on the casing and in the compost.
- Provide the necessary information required by AAFC for registration of products already registered in the USA.
- Develop biological control agents against mushroom diseases
- Determine post-crop temperatures and post-harvest management procedures necessary to eradicate a *Trichoderma* green mould infection.
- Determine factors that contribute to an airborne *Trichoderma* green mould infection.

Production

- Determine influence of straw cultivars, poultry litter bedding, feed additives, ammonia suppressants and pesticide residues on composting, mushroom production and human health
- Pinpoint the most probable procedures or materials used during Phase I composting that produces offensive odors.
- Determine the effect of water quality on mushrooms.
- Develop a method to detect ammonia suppressants in poultry litter.
- Prepare a literature review of the nutritional benefit of mushrooms
- Develop criteria for sugar beet lime as a casing material.

Specialty Mushrooms – Short term priorities (within two years)

Insects and diseases

Work with pesticide companies to expand pesticide labels to include specialty mushrooms

Production

Optimize environmental management to maximize production and quality

Evaluation strains to optimize mushroom production, quality, and disease resistance

Other (not ranked)

- a. Develop "sporeless" variety of oyster mushroom
- b. Develop biocontrol/non-chemical methods for insect and disease management
- c. Develop marketing strategy and retail presentation

Service Priorities

Commercial Mushrooms

- a) Identification of insects, diseases and weed moulds; and compost odor analysis
- b) Telephone consultations
- c) On-site farm visits
- d) Workshops
- e) Technology transfer and training via internet

Specialty Mushrooms

- a) Be an information centre on advances in specialty mushroom production
- b) Identification of insects, diseases (bacteria, fungi, virus) and weed moulds
- c) Telephone consultations
- d) On-site farm visits
- e) Workshops

Priorities for Minor Use Registrations:

Table 1. Overall Crop Pest Rating - Greenhouse Vegetables

Overall Priority Rating	Pest	Crop	Reasons
1	Powdery Mildew	Cucumber Pepper	Resistance appears to have developed New disease in pepper, only 1 product registered
2	Botrytis	Tomato	Resistance appears to have developed to current product, can cause significant losses (13% yield loss reported in 2000 in one crop.

		Cucumber	Resistance appears to have developed to current product
3	Root diseases	Cucumber	Significant losses can occur Only 1 product registered for Pythium
		Tomato & Pepper	No products registered
4	Thrips	Cucumber, Tomato, Pepper	No products registered, Lannate for Cukes not on current label New thrips problem – Echinothrips – threatens cukes & pepper
5	Whitefly	Tomato,	IPM-compatible products needed, none currently registered for use during crop
		Cucumber	Vector Beet Pseudo Yellows in cukes Resistance exist to current products IPM-compatible products needed, none currently registered for use during crop
6	*Lygus bugs	Cucumber Pepper	No products currently registered for its control IPM-compatible products needed IPM-compatible products needed
7	*Cucumber beetles	Cucumber	No products currently registered for its control IPM-compatible products needed
8	<i>Fusarium solani</i>	Cucumber	New disease No products currently registered for its control
9	Two-spotted spider mite	Cucumber, Tomato, Pepper	Resistance appears to have developed to current products IPM-compatible products needed
10	Aphids	Cucumber, Tomato, Pepper	IPM-compatible products needed Vector viruses in all crops

* These pests are particularly important because of the disruption they cause in biological control programs.

Table 1a. Overall Crop Pest Rating - Mushrooms

Overall			
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Priority Rating	Pest	Crop	Reasons
1	Green mould disease - <i>Trichoderma harzianum</i> (biotype Th4)	Commercial mushrooms	75% of Ontario's farms with infection histories. Significant losses occur. Accumulative dollar losses in millions. Controlled principally by sanitation and hygiene. Easily vectored by humans and insects. Coating of spawn grain with benomyl helps; resistance developing in USA. No fungicide effective once infection starts.
2	Dry bubble disease (<i>Verticillium fungicola</i>)	Commercial mushrooms	All Ontario farms with infection histories. Easily vectored by humans and insects. Resistance to benomyl. Products with zineb not exportable to USA. Chlorothalonil, marginal control, phytotoxic to mushroom mycelia.
3	Trichoderma spp	Commercial Mushrooms Specialty Mushrooms	Spotting of mushroom caps, reducing quality. No fungicide registered during production. A common contaminant of oyster and shiitake substrate. No fungicide permitted. Losses frequently high.
4	Bacterial blotch	Commercial and Specialty Mushrooms	Spots and decay of tissue. Controlled principally by environmental management. Chlorine lowers population density.
5	Sciarid fly: (<i>Lycoriella mali</i>)	Commercial and specialty mushrooms	Direct damage by larvae; adults as significant vector for diseases.
6	Cobweb disease (<i>Cladobotrium dendroides</i>)	Commercial mushrooms	Infrequent occurrence in Canada. Highly resistant strain in Europe.

Table 3. Minor Use Pesticide Registration Wish List to OHRSC & OPMRSC - Greenhouse Vegetables

Overall	Chemical	Crop	Pest	Registration Status	Justification
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Rating	Name				
Insecticides & Acaricides					
1	Conserve	cucumber, tomato, pepper	Thrips	USA	No current registrations IPM-compatible
2	Distance/Knack	cucumber, tomato	Whiteflies	USA	Spread virus in cukes IPM-compatible
3	Endeavour	cucumber, tomato, pepper	Aphids & Whiteflies	USA	Spread virus in cukes IPM-compatible
4	Floramite	cucumber, tomato, pepper	Spider mites	USA	Needed for resistance management IPM-compatible
5	Buprofezin/	Cucumber, tomato	Whiteflies		Can do joint review with IR4
	Botanigard	Cuc, tom, pepper	Whiteflies, thrips, aphids		May be IPM-compatible

Fungicides					
1	Sovran	Tom, Cuc	Powdery mildew, also gummy stem blight in cukes	USA	Needed for resistance management IPM-compatible
	Quinoxifen	Pepper	Powdery mildew		Eligible for IR4 joint review
2	Decree	Tom, Cuc, Pep	Botrytis	USA	Needed for resistance management IPM-compatible
3	Rootshield	Tom, Cuc, Pep	Root diseases	USA	No products registered for Pythium control in tom & pepp IPM-compatible
4	Previcur	Tomato &	Pythium		No products registered for Pythium control in tom & pepp

		Pepper			IPM-compatible
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Table 3a. Minor Use Pesticide Registration Wish List to OHRSC & OPMRSC - Mushrooms

Overall Rating	Chemical Name	Crop	Pest	Registratio n Status	Justification
Insecticides					
1	Dimlin / diflubenzuron	Commercial mushrooms	Sciarid fly larvae	USA	No product registered for casing
3	Vectobac / Bti	Commercial mushrooms	Sciarid fly larvae	USA	biological control agent
2	Neem / azadirachtin	Commercial mushrooms	Sciarid fly adults	USA	biorational; management of resistance
4	Pounce / permethrin	Specialty mushrooms	Sciarid fly adults	CDN	Registered for commercial mushrooms. *No insecticides specifically registered in Canada for specialty mushrooms
5	Citation / cyromazine	Specialty mushrooms	Sciarid fly larvae	CDN	Registered for commercial mushrooms in compost. *No insecticides specifically registered in Canada for specialty mushrooms
6	Diazinon	Specialty mushrooms	Sciarid fly adults	CDN	Registered for commercial mushrooms as a premise spray. *No insecticides specifically registered in Canada for specialty mushrooms
Fungicides					
1	Mertec	Commercial mushrooms	Verticillium fungicola	USA	Less phytotoxic to mycelia

2	Benlate	Specialty mushrooms	Trichoderma spp	CDN	Registered for commercial mushrooms in casing *No fungicides specifically registered in Canada for specialty mushrooms
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Priorities Identified For OMAFRA Special Research Program

1. Development of control strategies for economically important plant diseases such as powdery mildew, Pythium, Botrytis, and Bacterial Canker, Fusarium stem & root rot of cucumber.
2. Development of strategies such as trap crops, insect exclusion via screening of vents, and new biological control agents, for improving control of new and old pests that disrupt IPM programs, such as thrips, lygus bugs, cucumber beetles, and whiteflies.
3. Investigate the potential for the use of disinfectants such as chlorine bleach, Virkon, Physam 20, and the fungicide Phyton 27, as protectants against diseases, particularly bacterial and fungal diseases.
4. Investigate strategies to reduce efficiency of insects as vectors of plant diseases such as CMV by aphids, Beet Pseudo Yellows Virus by whiteflies etc.
5. Identification of sites and form of dormant stages of bacterial and fungal pathogens in order to effect rational control between crops with disinfectants and modification of cultural practices.
6. Efficacy testing of fungicides and disinfectants against such fungi as *Trichoderma harzianum*, *Verticillium fungicola*, *Mycogona perniciosa* and *Cladobotryum (Dactylium) dendroides*.

GREENHOUSE FLORICULTURE

MINOR USE PESTICIDE REGISTRATION WISHLIST TO OHRSCC & OPMRSC

Overall Rating	Chemical Name	Brand Name	Company	Crop	Registration Status			Justification									
					CDN	USA	IR4	1	2	3	4	5	6	7	8	Other	
Example	Imadacloprid	Admire	Bayer	Grape	Grape and potato leafhoppers	✓	✓		X			X		X	X	X	New varieties planted more susceptible

Insecticides and Acaracides																	
1	Bifenazate	Floramite	UniRoyal	Greenhouse ornamentals	Mites	X					X	X	X	X	X		
2	Beauveria bassiana	Botanigard	Mycotech	Greenhouse ornamentals	Thrips, aphids, whiteflies	X					X			X		X	
3	Pymetrozine	Endeavor	Syngenta	Greenhouse ornamentals	Aphids, whiteflies	X					X	X	X	X	X	X	
4	Buprofezin	Applaud	AgrEvo	Greenhouse ornamentals	whiteflies	X					X	X	X	X	X	X	
5	Clofentezine	Apollo	AgrEvo	Greenhouse ornamentals	Twospotted spider mite	X					X	X	X	X	X	X	

Fungicides																	
1	fludioxinil	Medallion	Syngenta	Greenhouse ornamentals	Various diseases	X						X	X	X	X	X	
2	azoxystrobin	Heritage	Syngenta (Zeneca)	Greenhouse ornamentals	Various diseases	X						X	X	X	X	X	
3	flutolanil	Contrast	Scotts	Greenhouse ornamentals	Basidio-mycete fungi	X						X	X	X	X	X	
4	Trichoderma harzianum	RootShield	BioWorks	Greenhouse ornamentals	Various root diseases	X						X		X		X	
5	Hydrogen dioxide	ZeroTol	BioSafe Systems	Greenhouse ornamentals	Various diseases	X						X	X	X	X	X	

Justification Reasons:

1. No pesticide registered to control this pest.
2. New introduced pest problem
3. New crop.
4. EBDC fungicide replacement or OP insecticide replacement.
5. Resistance management tool
6. More effective therefore pesticide reduction.
7. Reduce risk product or support new IPM approach ie. Predictive models, pheromone control program
8. Export crop: need to harmonize pest control options or establish a crop tolerance.

Registration Status:

IR 4 Codes: I means In-Progress; C- completed and submitted to EPA; P means proposed but not approved or started yet.

Overall Rating	Chemical Name	Brand Name	Company	Crop	Registration Status			Justification									
					CDN	USA	IR4	1	2	3	4	5	6	7	8	Other	
Example	imadacloprid	Admire	Bayer	Grape	✓	✓	C	X				X		X	X	X	New varieties planted more susceptible
Herbicides																	
1																	
2																	
3																	
4																	
5																	
Plant Growth Regulators																	
1	Ethyl-bloc	MCP	Floralife	Greenhouse ornamentals				X								X	
2	ethephon	Ethrel	Aventis	Greenhouse ornamentals		X		X								X	
3	ancymidol	A-Rest	SePro	Bedding plants, hydrangea, tulips	X	X										X	
4	Benzyladenine (BA)/ Gibberellins A ₁ +A ₇ (GA)	Promalin	Valent	Lilies	X	X		X								X	
5																	

Justification Reasons:

9. No herbicide/plant growth regulator registered to control this pest or manipulate the crop.
10. New introduced or opportunistic weed.
11. New crop.
12. Loss of older herbicides.

13. Resistance management tool
14. More effective product therefore pesticide reduction.
15. Support new IPM approach ie. Predictive models or weed threshold
16. Export crop: need to harmonize pest control options or establish a crop tolerance.

Registration Status:

IR 4 Codes: I means In-Progress; C- completed and submitted to EPA; P means proposed but not approved or started yet.

LOW ACREAGE & SPECIAL CROPS

Minor Use Priorities

Minor use priorities were identified for a number of the low acreage and special crops including cucurbits, peppers, asparagus, snap and lima beans, chicory, sweet potato, herbs, hemp, eggplant, sugarbeets, pearl millet and sorghum.

NB. Minor use work remains a high priority for the agricultural industry. In order to keep pace with products, available to U.S. counterparts work needs to be initiated and minor use completed if Ontario producers are to compete in an ever-competitive global market place.

Minor use priorities

Cucurbits

1. assure.... (grasses)
2. viper
3. command... formerly merit... (broadleaf weeds)
4. admire ST... (striped cucumber beetles)
5. poast.... (grasses)
6. nova - can we drop assure? Or poast? Exchange nova (1) for assure (1) (refer to J. Chaput)

Peppers:

1. command... broadleaf weeds
2. poast... (grasses)

Asparagus

1. liuron... (emerging weeds during harvest)
2. azoxystrobin... (purple spot)
3. halosulfuron.... (late season pigweed and broadleaf weeds)
4. spinosad... (control of asparagus beetles)
5. tebuconazole.... (rust)

Snap and Lima beans

1. (refer to J. Chaput)

Chicory

1. upbait
2. assure (grasses)
3. benifin
4. quadris... (foliar disease - cercospora)

Sweet potato

1. devrinol....
2. Command... (broadleaf weeds)
3. Aztec... (wireworms)

Herbs

1. biopesticides
2. beauveria bassiana
3. insecticides and fungicides for culinary ...

Hemp

1. (refer to J. Chaput)

Eggplant

1. imidacloprid...admire
2. alternate to imidacloprid
3. pyrimite....(mites)

Sugarbeets

1. eminent...tetraconazole....fungicide...Sipcon out of Georgia-URMULE
2. 4-way microrate....(weeds)
3. dual/magnesium (poast)(weeds)
4. foliar...tebuconazole....cercospora

Millet/Sorghum Grains

1. atrazine + bromoxynil....(weeds)
2. vitaflow....carruthii

NB. Increased emphasis should be put on the evaluation of systemic fungicides for low acreage and special crops. It is important to speed up the process and work in compliance with the IR-4 program.

Research and Services Priorities

1. Pursue minor use pest control product registrations for improved management of insects, diseases and weeds of low acreage and special crops which have a poor IPM toolkit. In light of the U.S. FQPA and continuing lack of a 'level playing field' for Ontario growers, the registration of new, 'reduced-risk' active ingredients is also urgently needed. Increased cooperation with the US IR-4 program is strongly encouraged. In addition, the need for GLP certification of the University of Guelph, Laboratory and AAFC field research stations is required for all minor use residue trials.
2. Continue to evaluate and enhance variety research for each specific crop that is considered low acreage and special including cucurbits, peppers, asparagus, snap beans, chicory (root), sweet potato, garlic, herbs (culinary/medicinal), stevia, egg plant, sugarbeet, millet/sorghum grain, hemp, spinach, rhubarb, okra. Parameters to be measured include suitability to Ontario growing conditions, pest and disease resistance, post harvest handling and storage conditions, market demand. Such work to include GMO varieties.
3. Enhance Nutrient management research including evaluating current recommendations through crop response research (crop uptake/removal of nutrients and effects on nutritional

aspects of low acreage and special crops) assessments of application technology, best management practices and the environmental fate of the essential crop nutrients, with particular attention to nitrogen and phosphorus.

4. Continue and enhance research and technology transfer in the area of post harvest handling of low acreage and special crops. This priority in light of ever increasing incidence of pest pressure, and on-farm environmental issues pertaining to nutrient management, air and water quality, food safety and producer liability.

5. Enhance a third party non-biased Integrated Pest Management Program and an accurate and reputable field diagnostic service for growers.

*Asparagus Research and Services Subcommittee Report - see attached

MUCK CROPS

Minor Use Priorities

J. Chaput summarized the current, proposed and completed minor use submissions for onions, lettuce, carrots and celery. The committee reviewed new minor use needs and ranked them for each commodity, as shown below:

Onions	Carrots	Celery	Lettuce
Norton	BAS 516	Poast Ultra	Fulfill
Frontier	Folicur	BAS 500	Switch
Regent	BAS 500	BAS 516	BAS 516
Flint		Agrimek	USF 2001
Spinosad			Gavel
Folicure			
Aztec			
Fulfill			

Research & Services Priorities

Research & Services priorities were reviewed and ranked in order of importance, as follows.

1. **Nutrient Management Issues.** In light of impending provincial nutrient management legislation, research is required to review and revise current information and recommendations for muck crops. Special emphasis should be placed on an integrated fertility program which takes into account the complete soil nutrition regime and nutrient management planning; validation of crop uptake, crop removal, and growth stage models **specific to muck crops** are required as well as a revision of current Provincial recommendations.

R & S

Personnel identified to assist: C. Kessel, M. R. McDonald, J. Uyenaka

2. **Disease Management.** Effective management practices are needed for foliar and soil-borne diseases of all muck crops, with particular emphasis on *Sclerotinia*, *Pythium*, *Sclerotium*, and *Rhizoctonia* spp.: leaf blight, early and late blight, corky root rot, bacterial leaf spot, downy mildew, white rot, violet root rot, crown rot and crater rot. Approaches may include cultivar resistance, fungicides, biological controls, and soil amendments, among others. Information on the biology and epidemiology of these diseases is also needed.

R

Personnel identified to assist: M. R. McDonald, G.J. Boland, T. Hsiang

3. **Integrated crop management of muck vegetables including IPM development for all insect pests and nematodes.** Development of appropriate management practices including, but not limited to, cultivar resistance and alternatives to pesticides, for control of pea leafminer, tarnished plant bug, aphids, cutworms, onion maggot, and onion thrips. Development of integrated nematode management for carrots and other muck crops, including methods such as crop rotations, soil amendments, band fumigation and late fall plowing. Damage thresholds and symptom expressions for species such as lesion and pin nematodes should also be considered.

R

Personnel identified to assist: R.H. Hallett, C. Scott-Dupree, J. Tolman, M. R. McDonald, G. Boivin.

4. **Minor Use Pesticide Registrations.** Pursue minor use pesticide registrations for improved control of insects, diseases and weeds of muck crops. There is a particular need for minor use research on herbicides and insecticides for green bunching onions. In light of the US FQPA and continuing lack of a 'level playing field' for Ontario growers, the registration of new, 'reduced risk' active ingredients is also urgently needed. Increased cooperation with the US IR-4 program is strongly encouraged. In addition the need for GLP certification of Univ. of Guelph, Laboratory and AAFC field stations is required for future minor use residue trials.

R

Personnel identified to assist: J. Chaput, C. Hunter

5. **Micronutrient and Tissue Analysis Recommendations.** Improvements in fertilizer recommendations for muck crops with particular emphasis on in-field evaluation of new micronutrient formulations and the use of tissue analysis.

R&S

Personnel identified to assist: C. Kessel, J. Uyenaka

6. **Development of Integrated Weed Management Programs.** Cultural practices, new pre- and post-emergence herbicides, herbicide banding, new weed introductions and changes in the weed complex are vital considerations. The weeds of special concern are yellow nutsedge, common groundsel and grasses. Practical short and long term solutions must be identified.

R

Personnel identified to assist: F. Tardif

7. **Cultivar Evaluations.** Continue to evaluate muck crop varieties for suitability to Ontario growing conditions, storage conditions, market demand, and pest/disease resistance, with emphasis on processing carrots and all varieties of lettuce.

R & S

Personnel identified to assist: M.R. McDonald

Research Priorities for OMAFRA's "Special Research Program"

Priorities were considered and ranked according to commodity group, as follows:

Category 1: Minor Use Projects:

Onions:

1. Norton, ethofumesate, weeds, AVENTIS
2. Frontier, dimethenamid, nutsedge & other weeds, BASF
3. Regent, fipronil, root maggots, AVENTIS

Carrots:

2. BAS 516, Foliar diseases, BASF
3. Folicur, tebuconazole, *Sclerotinia*, white rot, *Rhizoctonia* diseases, BAYER
4. BAS 500, Foliar diseases, BASF

Celery:

1. Poast Ultra, sethoxydim, grasses, BASF
2. BAS 500, Foliar diseases, BASF
3. BAS 516, Foliar diseases, BASF

Lettuce:

1. Fulfill, pymetrozine, aphids & leafhoppers, SYNGENTA
2. Switch, cyprodinil+fludioxonil, diseases
3. BAS 516, Foliar diseases, BASF

Category 2: Pesticide Reduction & Safe Usage

Onions:

1. Development of integrated crop management strategies to control white rot in onions. Strategies to include synthetic and natural garlic oils, partially resistant cultivars, biological controls and crop rotations.
2. Development of integrated pest management strategies for the control of onion maggot and onion smut. Strategies include resistance management, chemical placement and coverage, new pest control products and technologies.

3. Development of an integrated weed (i.e. yellow nutsedge, common groundsel and annual bluegrass) control program for onions. The program should consider cultural practices, new pre- and post emergence herbicides, new weed introductions, herbicide banding and weed complex.

Carrots:

1. The continued development of ICM practices for diseases in storage systems, with particular emphasis on *Sclerotinia* on carrot under non-ideal temperatures.
2. Development of integrated nematode management for carrots, including methods such as crop rotations, soil amendments, band fumigation and late fall plowing. Damage thresholds and symptom expressions for species such as lesion and pin nematodes should also be considered.
3. Effective management practices are needed for soil-borne diseases of carrots, including *Pythium*, *Sclerotinia*, *Rhizoctonia*. Approaches may include fungicides, biological controls, and soil amendments, among others. Information on the biology and epidemiology of these diseases is also needed.

Celery:

1. Investigate the biology of pea leaf miner and develop IPM strategies for the control of this and other vegetable leaf miners. Knowledge of the preferred host range and development of appropriate management practices is required.
2. Effective management practices are needed for foliar diseases of celery, including leaf blight and early and late blight.
3. Development of effective management practices for control of aphids on celery.

Lettuce:

1. Development of effective management practices for *Sclerotinia* on lettuce in light of the loss of fungicides. Methods may include alternatives to fungicides, crop rotations, and fertility practices.
2. Development of alternative management strategies for *Pythium* diseases for lettuce, in light of inconsistent control achieved with existing fungicides.

Category 3: Emerging Pests

Carrots:

1. The development of an effective technique for monitoring carrot weevil is essential in order to determine the occurrence of a second generation in Ontario. In addition, effective management practices are required as poor control is achieved with registered insecticides.

2. Carrot rust fly is becoming an increasing problem in carrots and effective management techniques are required, as well as information about its biology.
3. There is a need for proactive research into effective control of grassy weeds in carrots, in anticipation of the potential loss of registered herbicides.

Celery:

1. The development of effective management practices are needed for control of carrot weevil in celery. In addition, development of an effective technique for monitoring carrot weevil is required in order to determine the occurrence of a second generation in Ontario.
2. There is a need for proactive research into effective control of grassy weeds in carrots, in anticipation of the potential loss of registered herbicides.
3. Research is needed into new sources of *Fusarium* resistance, due to the potential for resistance to be overcome by *Fusarium* strains in the future and the possible loss of tolerant varieties due to seed company restructuring.

Lettuce:

1. There are currently no chemical methods of control for corky root rot of lettuce. Research is required into effective control practices and alternatives to fungicides.
2. Bacterial leaf spot is an increasing problem in non-muck soils, and of sporadic occurrence in Holland Marsh. Effective control practices are required, and may include seed and bactericide treatments and cultivar susceptibility assessments.

NURSERY/LANDSCAPE & TURFGRASS

1. Pesticides and integrated pest management (Research/Service)
2. Improved understanding of plum pox virus (Research)
3. Water use and management (Research/Service)
4. Coordination of tech transfer / information tools (Service)

Overall - Chemical Name - Brand Name - Company				Registration Status			Justification								Other
Rating	Chemical Name	Brand Name	Company	CDN	USA	IR4	1	2	3	4	5	6	7	8	
Insecticides and Acaricides															
1	imidacloprid	Merit	Bayer	X	X		X								European chafers causing significant root damage plus Viburnum leaf beetle causing defoliation in nurseries/landscape (soil drench/granular is effective). Possibility of systemic injectable systems (i.e. little impact on environment) for landscape trees.
2	cyfluthrin	Tempo 20WP	Bayer		X		X	X						X	This quarantined pest is preventing the sale and shipment of pine nursery stock (including x-mis tress) out of infested regions.
3	Imidacloprid	Merit 75W	Bayer	X	X		X							X	This quarantined pest is preventing the sale and shipment of pine nursery stock (including x-mis tress) out of infested regions.

4	deltamethrin	Decis/Delta Guard	Aventis	Woody ornamentals under field or container production	Pine shoot beetle, leaf beetles, sawfly, Japanese beetle (adult), aphids, leafhoppers, mites, lepidopteran larvae	X	X					X	X	X	X	X	Another class of insecticide to rotate with. Can replace older OP's.
5	Pyridaben	Dyno-mite	BASF Plant Products	Woody ornamentals in field and container	Two-spotted spider mite	X	X					X	X	X	X	X	If lose OP registration, only one product available for management, therefore run into resistance problems.
6	Abamectin	Avid	Syngenta	Field grown woody and herbaceous ornamentals	European red mite, two- spotted spider mite, spruce spider mite	X	X					X	X	X	X	X	If lose OP registration, only one product available for management, therefore run into resistance problems.
7	diflubenzuron	Dimilin	UniRoyal	Field grown woody ornamentals	Spruce budworm, cankerworm, gypsy moth, tent caterpillar, leafminers, pine shoot moth, sawfly, webworm, terminal weevils	X	X					X	X	X	X	X	Could replace older, toxic OP's. Applicator safety and safe for many beneficials.

8		clofentezine	Ovation/ Apollo	Scotts	Ornamental tree fruit in field production	European red mite and two- spotted spider mite (ovicide)	X	X			X	X	X	X	X	No ovicidal acaricides registered in Canada on ornamentals. Would give good control before populations become damaging (therefore reduced pesticide use).
Fungicides																
1		Propiconazole	Topas	Engage Agro	ornamentals	Powdery mildew and rust	X	X								
2		Metalaxyl-M	Subdue Maxx		ornamentals	Root rot (phytophthora , pythium) and Downy mildew		X						X		Copper is main fungicide used for soil fungi, not many effective alternatives.
3																
4																
5																

Justification Reasons:

9. No pesticide registered to control this pest.
10. New introduced pest problem
11. New crop.
12. EBDC fungicide replacement or OP insecticide replacement.
13. Resistance management tool
14. More effective therefore pesticide reduction.
15. Reduce risk product or support new IPM approach ie. Predictive models, pheromone control program
16. Export crop: need to harmonize pest control options or establish a crop tolerance.

Registration Status:

IR 4 Codes: I means In-Progress; C- completed and submitted to EPA; P means proposed but not approved or started yet.

Overall Rating	Chemical Name	Brand Name	Company	Crop	Registration Status			Justification								
					CDN	USA	IR4	1	2	3	4	5	6	7	8	Other
Herbicides																
1	oxyfluorfen and pendimethalin	OH-II (granular)	Scotts	Container ornamental (outdoor)	Most broadleaf weeds (e.g. bittercress, chickweed, groundsel, liverwort) and many grasses	X	X						X	X	X	Granular formulation means less foliar burn and reduced risk for applicator. Wider host range for container crop safety than other registered products.
2	pendimethalin	Prowl	Cyanamid	Ornamental field and landscape (including x-mas trees)	annual grasses, common chickweed, lamb's-quarters and pigweed	X	X						X	X	X	

Justification Reasons:

- 17. No herbicide/plant growth regulator registered to control this pest or manipulate the crop.
- 18. New introduced or opportunistic weed.
- 19. New crop.
- 20. Loss of older herbicides.
- 21. Resistance management tool
- 22. More effective product therefore pesticide reduction.
- 23. Support new IPM approach ie. Predictive models or weed threshold
- 24. Export crop: need to harmonize pest control options or establish a crop tolerance.

Registration Status:

IR 4 Codes: I means In-Progress; C- completed and submitted to EPA; P means proposed but not approved or started yet.

POTATO

Research Priorities

- 1. Control of Soil Borne Diseases:** Scab, Pink Rot Rhizoctonia, Early Dying. These diseases are of major importance in potato production. Because crop rotation is not an effective method for controlling them, research is needed to identify environmentally friendly methods that can reduce their incidence.
- 2. Wireworm Control.** At the present time, there are no effective chemicals to control wireworms. Potato growers who introduce in their rotation fields that have been in forages for a number of years, risk serious losses due to wireworm damage. Evaluation of new materials to control wireworms is urgently needed.
- 3. Evaluation of New Varieties for the Ontario Market.** To remain competitive, potato growers must grow varieties with the characteristics that consumers demand. In addition, these varieties should have tolerance to diseases, good yields etc to produce a profitable crop. Testing new varieties under Ontario conditions is crucial for the selection of lines that the provincial market requires.
- 4. Late Blight Management.** Late blight is the most devastating fungal disease of potatoes. Infected seed tubers are major sources of inoculum. Seed treatments and forecasting models for the A2 strain are areas that should be investigated.
- 5. Monitoring Insecticide Resistance.** The Colorado Potato Beetle has demonstrated a tremendous ability to develop resistance to insecticides. Admire is the only insecticide registered in Ontario that is effective on all CPB stages. In 2000, no resistance to Admire was detected in a provincial survey conducted by AAFC. Monitoring the potential development of resistance to Admire is extremely important to alert growers if decreased susceptibility is detected. Aphids have developed resistance to insecticides in other potato production areas. Monitoring aphid resistance in Ontario it is important before control problems develop.
- 6. Chip Quality.** Research is needed to acquire information on the manipulation of storage conditions to get good chip quality. Low temperature sweetening of potato tubers reduces the quality of potato chips by darkening the color. A method for predicting acceptable chip color should be developed.
- 7. Greenhouse Minituber Production for Seed Potatoes.** The production of minitubers at the Spud Unit is critical for the Ontario Seed Potato Growers. Research to improve the yields of greenhouse Nuclear minitubers benefits the seed potato producers by reducing the cost of production
- 8. Food Safety.** Water Quality and Manure Applications.

Service Priorities

1. Registration of Quadris (Early Blight), Spinosad (CPB), Actara (CPB, Leafhoppers), and Fipronil (CPB, Wireworms) .
2. Maintain Tissue Culture Production for the Seed Potato Program at the SPUD Unit. The SPUD Unit is the foundation of the Ontario Seed Potato Program supplying producers with high quality Nuclear minitubers. This service is essential to the industry.

Summary Of Research Priorities For Pesticide Reduction And Safe Usage Section Of Special Research.

1. MINOR USE REGISTRATION

Quadris
Spinosad
Actara
Fulfill
Fipronil

2. PESTICIDE REDUCTION

Control of Soilborne Diseases
Wireworm Control
Late Blight Management
Insecticide Resistance Monitoring

3. EMERGING PESTS

Pink Rot
Powdery scab

SWEET CORN

Research Priorities

1. Cultural Practices.

A. Nutrient Management.

Nitrogen and phosphorous in nutrient management planning; specifically, crop nutrient uptake and removal, updating OMAFRA recommendations, environmental impact and nutrient use efficiency on both plastic mulch and bare ground. This work is being done to a limited degree at AAFC in Harrow, but a more extensive research effort is needed in order to account the many factors which affect nutrient uptake, such climatic differences, soil types.

B. Crop Management.

There is a need for research on management systems which will improve yields and reduce input costs in sweet corn production. This should include fine-tuning production systems specific to different cultivars. This would include research on row spacing, plant populations, fertility (pre-side dress nitrogen test), biodegradable mulches and methods which contribute to earliness.

2. Weed Control

Continued work on herbicide label expansions of field corn herbicides is needed, as well as a better understanding of integrated weed management for sweet corn

3. Insect Control

European corn borer control continues to be a challenge in most years. Corn earworm can also cause heavy damage in some years. Aphids are no longer considered only a cosmetic pest with no economic importance. The recent problem with Stewarts Wilt has made the corn flea beetle an insect of concern. Continued evaluation of new insecticides and alternatives to insecticides for these pests is needed

4. Disease Management

Continued evaluation of new products for disease management in sweet corn is needed.

5. Cultivar Evaluations

With the continued release of large numbers of cultivars by seed companies, cultivar evaluations need to continue in order to keep the industry aware of these new products. These evaluations are useful to growers, processors, and seed companies.

Service Priorities

1. Food Safety

Extension efforts need to be made in educating growers on the proper handling of fresh produce from a food safety aspect. Sanitation of wash water used for hydrocooling is a particular area where information is needed

2. Integrated Pest Management Delivery.

With the loss of the OMAFRA sweet corn IPM specialist, the availability of IPM recommendations is needed, especially for corn earworm.

TENDER FRUIT

Research Priorities

1. Tree fruit breeding research - direct to C. Swanton, U. of Guelph
 - evaluate varietal susceptibility re PPV susceptibility and tolerance
 - continue to evaluate rootstock trials (NC-140)
 - maintaining input especially cling stone breeding program
 - Nabisco require late season processing pear
2. Nutrient management plans (research needs) need to review OMAFRA nutrient recommendations for orchards
 - uptake and removal of nitrogen in a perennial crop (tree) system - impact on timing of fertilizer applications
 - review nitrogen and nitrogen:potassium balance

- look into environmental and water quality issues
- post-harvest considerations (interaction of plant nutrition with storage, etc)
- 3. Orchard management systems - need to refill this position
- 3. Assess germplasm for PPV resistance and screen new potential imports
- 3. Root systems and rootstock evaluations - NC140 (or equivalent) project
- 3. IPM (pests and diseases) management systems
- 3. By-products - alternate markets for culled fruit (e.g. small 'Bosc' pears)

The 1999 report presented a Table of the on-going general areas of research considered desirable and the priority in terms of need or importance and the level of research desired.

Service Priorities

1. Publication 430 Cultivar lists/publication - revision
 - alternative is small steering committee and web-site with local hard copy
 - Slingerland (OMAFRA) to set up a small working group
 - driven by commodity groups
2. *Prunus* certification program
 - domestic certification is essential
 - partners - growers, nurseries, OMAFRA, CFIA, AAFC, OFTA
 - the industry (OTFPMB, Landscape Ontario, CNLA) need to take lead role - need for short-term and long-term protocols
3. Need for basic statistics on value added potential and alternatives
3. Food Safety - an accreditation body requirement e.g. Food Inspection
3. IPM delivery options
 - OMAFRA still involved in fact sheets, but is now out of one-on-one delivery, supervision of scouts and Agri-Phone delivery
 - OFVGA will be offering a full service program through AIMS - program needs to be finalized for 2001
 - OTFPMB sending out questionnaire on IPM delivery
 - still needs a lot of input to have a system in place for 2001

OCPC Priorities 2000

OCPC submitted a list of eight (8) priorities to be addressed by TFRSSC. Prior to ranking these priorities, TFRSSC reduced this list to six (6) by combining the two (2) recommendations on brown rot and the two (2) recommendations on bacterial spot.

The following is the list of OCPC priorities as ranked by TFRSSC:

1. Plum pox virus
 - aphid transmission studies
 - requirement for herbicide treatment of tree stump to prevent regrowth (may need registration for this use)
2. Evaluation of sustainable IPM program for control of OFM
 - impact on alternate hosts (e.g. apple, plum, pear)
 - secondary pest resurgence (e.g. plum curculio, tarnished plant bug)
 - economics of disruptive pheromone technology and control of secondary pests
 - impact of PPV and aphicides on IPM program
3. Genetic transformation to increase fire blight resistance
3. Bacterial spot of stone fruit - field evaluation of pesticides and development of sustainable controls (combined OCPC priorities).
3. Brown rot of tender fruit - resistance management studies and efficacy/IPM fit of new fungicides (combined OCPC priorities).
3. IPM strategies and resistance management strategies for pear psylla

Weed Management Priorities (from Leslie Huffinan)

No ranking was required - more of an awareness to TFRSSC, feedback to Weed Committee

- 2,4-D amine - registered for producing orchards, extension for non-producing (young) orchards
- herbicide required to prevent suckering of stumps of removed trees in PPV eradication program (may need registration for this use)

TOMATOES

Research Priorities

1. Breeding and cultivar evaluation for processing tomatoes. Emphasis should be placed on earliness, disease and pest resistance, reduction of mould counts, fruit firmness, peeled colour, field storage capability and field and factory yield. Cultivar evaluation for fresh market tomatoes is also a high priority.
2. Bacterial diseases are persistent problems for both fresh market and processing tomato growers. The development of diagnostic tools and management strategies, including biological

control, disease screening of seed and improved methods for detection of bacterial diseases in seed and plug plants is a high priority.

3. Sustainability of high yield and quality by studying soil structure and rotational implications is required. The use of organic amendments and cultural management practices to promote disease and nematode suppression and enhance quality and yield is also required.

4. Continue the development of pest management and resistance management strategies for insects (e.g. stink bug, Colorado potato beetle) and plant diseases. Pesticide evaluation and registration of new products and non chemical methods of control that fit into the management strategies developed is an important component.

5. Work must continue on weed control, crop tolerance evaluations, herbicide evaluation and registration of new materials for both processing and fresh market tomatoes. The minor use program is very valuable in getting products registered.

6. Research on cultural practices to enhance earliness is required. Components include, but are not limited to, the management of plug transplants to ensure rapid establishment and use of mulches for fresh market tomatoes (including biodegradable mulches and disposal options).

7. Management of water through irrigation, fertigation and the use of mulches to determine the effect on yield and quality of processing and fresh market tomatoes is required.

8. Nutrient management research including evaluating current recommendations through crop response research (crop uptake/removal of nutrients and effects on nutritional aspects of tomato), assessments of application technology, best management practices and the environmental fate of the essential crop nutrients, with particular attention to nitrogen and phosphorous is required.

9. Research is required on the nutraceutical effects of lycopene and other compounds present in tomatoes related to health benefits.

10. Studies on food safety related to tomato production and processing are required.

11. Studies into the implications and applications of genetic technology are required.

Service Priority

1. Continue the development and delivery of IPM programs including (but not limited to) disease prediction programs aimed at bacterial diseases and late blight.

Priorities Directed Towards Omafra's Pesticide Reduction And Safe Usage Section Of Special Research Fund

Crop = Tomato

Minor Use Registrations: (top 3 priorities)

1. Pinnacle + Sencor (post emerg.), broad leaf weeds, (Dupont and Bayer)
2. Prism + Sencor (post emerg.), hairy nightshade, broad leaf weeds ((Dupont and Bayer)
3. Bonsai, Confer/paclobutrazol, growth regulator for tomato plug plant production (Zeneca)

Pesticide Reduction and Safe Usage:

1. Bacterial diseases are persistent problems for both fresh market and processing tomato growers. The development of diagnostic tools and management strategies, including biological control, disease screening of seed and improved methods for detection of bacterial diseases in seed and plug plants is a high priority.
2. Sustainability of high yield and quality by studying soil structure and rotational implications is required. The use of organic amendments and cultural management practices to promote disease and nematode suppression and enhance quality and yield is also required.
3. Continue the development of pest management and resistance management strategies for insects (e.g. stink bug, Colorado potato beetle) and plant diseases. Pesticide evaluation and registration of new products and non chemical methods of control that fit into the management strategies developed is an important component.

Emerging Pests:

1. Evaluation of damage caused by stink bug on tomato and strategies for control.
2. Develop control strategies for problem weeds such as late season hairy nightshade and galinsoga on both fresh market and processing tomato.
3. Develop weed control methods for reduced tillage systems for tomato.

Overall Rating	Chemical Name	Brand Name	Company	Crop	Registration Status			Justification							
					CDN	USA	IR4	1	2	3	4	5	6	7	8
Example	imidacloprid	Admire	Bayer	Grape	✓	✓	C	X		X	X	X	X	X	X
				Grape and potato leafhoppers											New varieties planted more susceptible
Insecticides and Acaracides															
1															
2															
3															
Fungicides															
1	azoxystrobus	Quadris Abound Heritage	Zeneca	Tomato	X	X					X	X	X	X	New product with broader spectrum & longer residual control and lower rates.
2		Actigard	Novartis	Tomato		X						X		X	Plant resistance activator
3															
4															
5															

Justification Reasons:

1. No pesticide registered to control this pest.
2. New introduced pest problem
3. New crop.
4. EBDC fungicide replacement or OP insecticide replacement.
5. Resistance management tool
6. More effective therefore pesticide reduction.
7. Reduce risk product or support new IPM approach ie. Predictive models, pheromone control program
8. Export crop: need to harmonize pest control options or establish a crop tolerance.

Registration Status:

IR 4 Codes: I means In-Progress; C- completed and submitted to EPA; P means proposed but not approved or started yet

Overall Rating	Chemical Name	Brand Name	Company	Crop	Registration Status			Justification								
					CDN	USA	IR4	1	2	3	4	5	6	7	8	Other
Example	imadacloprid	Admire	Bayer	Grape	✓	✓	C	X			X	X	X	X	X	New varieties planted more susceptible.
					Grape and potato leafhoppers											
Herbicides																
1	thifensulfuron-methyl + metribuzin	Pinnacle + Sencor	Dupont Bayer	Tomato	broadleaf weeds	X	X	X						X	X	Limited choices avail. Mixtures provide broad spectrum weed control. Controls problem weeds.
2	rimsulfuron + metribuzin	Prism + Sencor	Dupont Bayer	Tomato	hairy nighthshade bdleaf weeds	X	X	X	X				X	X	X	Limited choices avail. Mixtures provide broad spectrum weed control. Controls problem weeds.
3	metolachlor	Dual	Novartis	Tomato	eastern black nighthshade & grasses	X		?						X	X	For minimum tillage systems.
4	thifensulfuron-methyl	Pinnacle	Dupont	Tomato, fresh market	triazine resistant lambsquarter	X		X						X		
Plant Growth Regulators																

Justification Reasons:

No herbicide/plant growth regulator registered to control this pest or manipulate the crop.

1. New introduced or opportunistic weed.
2. New crop.
3. Loss of older herbicides.
4. Resistance management tool
5. More effective product therefore pesticide reduction.
6. Support new IPM approach ie. Predictive models or weed threshold

7. Export crop: need to harmonize pest control options or establish a crop tolerance.

Registration Status:

IR 4 Codes: I means In-Progress; C- completed and submitted to EPA; P means proposed but not approved or started yet.

RECOMMENDATIONS ARISING FROM IDENTIFIED ISSUES

AGROFORESTRY

- ♦ The OHCRSC commends the Agroforestry subcommittee for the efforts of committee members to proactively work on addressing the issues and recommendation identified in your report.

APICULTURE & POLLINATION

Recommendation (New) 1:

Immediate Development of a Detection Strategy and Management Protocol for the Small Hive Beetle, *Aethina tumida*.

Background:

The small hive beetle was found in 1998 in bee colonies in Florida. It has spread to several states in the US including NY and Michigan. Ontario bee inspectors found these beetles in apiaries in NY State. These apiaries were 5 km from the Ontario-NY border. This beetle has killed more than 30,000 colonies in the US and has become a serious pest in honey houses. In the US, CheckMiteTM (Coumaphos) is used under section 18 to control the small hive beetle. Guard Star[®] is used as a soil treatment to kill the beetle pupae.

Ontario beekeepers are concerned that the beetles are in bee colonies within bee flying distance across the border. Another concern is that CheckMiteTM strips and Guard Star[®] are not registered for use in honeybee colonies in Canada. This beetle and the lack of control agents represent a serious threat to the beekeeping industry in Ontario. Studies should be initiated to develop a detection method to monitor the spread of the small hive beetles. The potential damage that can be caused by the beetle in Ontario needs to be assessed. The development of measures that fit into the beekeeping management practices to control the beetle is essential to protect the beekeeping industry. This issue should be addressed as soon as possible to avoid any major damage to bee colonies and disruption of the beekeeping industry. Thus, beekeepers will be able to provide farmers with the necessary honeybees for pollination.

Response: Activities have already been initiated by the Provincial Apiary Specialist to monitor for this pest and evaluate detection methods being used in the U.S. This recommendation has also been forwarded to PMRA, CFIA, AAFC, Environmental Biology, U of G and the OPMRSC for further response.

Recommendation 2:

Development of Varroa Mite-Resistant Bee Stocks Using Different Selection Approaches and Integrating Resistance into Existing Ontario Tracheal Mite-Resistant Bee Stocks.

Background:

Varroa mites continue to be a major concern. Varroa mites kill 50-70% of bee colonies annually if colonies are not treated. Breeding bees that are resistant to varroa is the long-term solution. Traits of honeybees such as hygiene, grooming and low mite reproduction are important for varroa control. We need to continue the selection and breeding program to breed these traits into Ontario tracheal mite-resistant bees. This will reduce the damaging effects of varroa on bees. Thus, beekeepers will gain the benefits of using these bees in the IPM program and will be able to reduce the use of miticides in bee colonies.

Response: It is the understanding of the OHCRSC that current research/tech transfer projects are addressing the issue identified in this recommendation.

Recommendation 3:

Further Development of An Effective Integrated Pest Management (IPM) Program For Control of Parasitic Mites and Infectious Diseases of Honey Bees.

Background:

Recent research by the OBA tech-transfer program has shown that oxalic acid is a promising chemical to be used for varroa control. More research is needed to study the side effects on bees and to try to get this product registered for use in bee colonies. Other management tools can be evaluated against mites and AFB. This is a long-term project that requires facilities and financial resources.

Response: It is the understanding of the OHCRSC that current research/tech transfer projects are addressing the issue identified in this recommendation.

Recommendation 4:

Quality of Hive Products to Meet Consumers Expectations.

Background:

This is an important issue for food safety and quality. Finding residues in bee products may damage the market and cause safety concerns to consumers. Monitoring residues in hive products needs to be continuous to ensure high quality and no contaminants as expected by the consumers. More resources need to be allocated for monitoring program to ensure food quality.

Response: The OHCRSC would encourage the subcommittee to pursue opportunities to inform beekeepers about this issue. The recommendation has also been forwarded to CFIA, OMAFRA Food Industry Division, Uof G Lab Services, OPMRSC and OFRSC.

Recommendation 5:

Maintain of the Apicultural Regulatory and Extension Programs in Ontario (previous recommendation).

Response: It is the understanding of the OHCRSC that current research/tech transfer projects are addressing the issue identified in this recommendation.



Recommendation 6:

Registration of CheckMite™(Coumaphos) and Guard Star®.

Background:

CheckMite™(Coumaphos) is an Organo-Posphate (OP) pesticide. The registration of CheckMite™is in question because it is one of the OP pesticides which are under review by the PMRA. Although beekeepers have some concerns about this product, this is the only product registered in the world to control the small hive beetle. As beekeepers, we encourage the use of a safer product to be used for the small hive beetle but until such time, we ask to get the CheckMite™and the Guard Star® registered.

Response: The OHCRSC would encourage members of the subcommittee to continue with their efforts to get these products registered for use in Canada. Referred to PMRA and the OPMRSC for additional response.

Recommendation 7:

Federal Registration of Formic Acid Mite-Away. (previous recommendation)

Response: The OHCRSC would encourage members of the subcommittee to continue with their efforts to get these products registered for use in Canada. Referred to PMRA and the OPMRSC for additional response.

Recommendation 8:

Monitoring for Varroa Resistance to Apistar®. (previous recommendation)

Response: It is the understanding of the OHCRSC that current research/tech transfer projects are addressing the issue identified in this recommendation.

Recommendation 9:

Development of a Marketing Strategy for Honey to Replace Imports. (previous recommendation)

Response: It is the understanding of the OHCRSC that current research/tech transfer projects are addressing the issue identified in this recommendation.

POLLINATION ISSUES

Recommendation 10:

Management Strategy for Machine Harvested Cucumbers.

Response: Referred to Dr. Mark Sears, Environmental Biology, University of Guelph

Background:

More research funds need to be allocated to conduct the necessary research. The OMAFRA research program at the University of Guelph can focus on providing some resources to study this problem. Any increase in cucumber pollination will help to increase the cash return to beekeepers and growers. A study of factors affecting pollination efficacy and requirements is needed to serve both Cucumber growers and beekeepers.

Recommendation 11:

Pollination Requirements of New Varieties of Apples (previous recommendation)

Response: It is the understanding of the OHCRSC that current research/tech transfer projects are addressing the issue identified in this recommendation.

Recommendation 12:

Produce a Best Management Practice Strategy for Pollination Management. (previous recommendation)

Response: It is the understanding of the OHCRSC that current research/tech transfer projects are addressing the issue identified in this recommendation.

Recommendation 13:

Integration of the Extension of Pollination Services into the Horticultural Extension Programs of Crop Technology for Better Services to the Farming Community. (previous recommendation)

Response: It is the understanding of the OHCRSC that current research/tech transfer projects are addressing the issue identified in this recommendation.

APPLE

Recommendation 14:

- That OMAFRA refill the position of Apple Specialist when Ken Wilson retires in June 2001.
- That OMAFRA provide technical support to the Apple IPM Specialist and the "discipline specialists" to assist in conducting development/research projects of significance to the industry.

- That AAFC immediately hire a Population Ecologist to replace the vacancy in Vineland and refill the Plant Pathologist and Nematologist positions in Vineland when the current researchers (John Northover and Dr. John Potter) in these positions retire in 2001.

Response: OMAFRA Crop Technology has been involved in discussions with industry organizations to confirm needs /issues and communicate ministry response. Also referred and Dr. Gilles Saindon, AAFC.

Recommendation 15:

That the Minister approve implementation of the Re-Start proposal submitted by the Apple Growers of Ontario on behalf of the Ontario apple industry.

Response:

This recommendation is beyond the scope of the OHCRSC. The OHCRSC would encourage direct dialogue with the appropriate ministry contacts in the Farm Products Marketing Commission and the Policy and Farm Finance Division.

Recommendation 16:

That OMAFRA immediately approve the Healthy Futures proposal, *Project Triad: Tree to Retailer Innovative Apple Development*, submitted by the Apple Growers of Ontario

Response: The OHCRSC would encourage the applicants to contact the Healthy Futures Secretariat directly to discuss the status of this proposal.

BERRY CROPS

Recommendation 17:

That nutrient management in berry crops be made a high priority in the competitive grant system currently available and in future grant programs.

Background:

Current fertility recommendations in Ontario are based on research conducted many decades past. Since that time, cultivars and production practices have changed and yields have increased. In light of the Nutrient Management Plans which will be developed for all crops in Ontario, it is essential that the macro- and micro-nutrient recommendations for strawberries in Ontario be evaluated. This has been a research recommendation of this committee for many years. However, there has not been a researcher to address this issue in the past. A researcher, Maria Derkacz, may now be available provided competitive research funding is available for nutrient management research in horticultural crops. Recommendations for nutrient application via trickle irrigation are needed as the industry is rapidly adopting this form of irrigation.

Response:

- ◆ The OHCRSC acknowledges that the need for additional funding for research and technology transfer in nutrient management for all horticultural crops is a high priority. Referred to ARIO, Dr. Yvon Martel, AAFC, OSWARC, OMAFRA

Recommendation 18:

That all stakeholders work together to develop a plan to bring this research to fruition, specifically:

- 1) that ARD, OMAFRA evaluates the potential for the application of this technology and takes the lead role in bringing the stakeholders together;
- 2) that OHCRSC make its subcommittees aware of this diagnostic technique and its potential; and
- 3) that LSD poll the subcommittees for their level of interest and support in order to develop a business case.

Background:

Techniques are becoming available for rapid diagnosis of crop diseases using DNA-based PCR techniques. Research to identify the primers required for disease diagnosis is being conducted worldwide for a variety of pathogens. This technique has widespread application for numerous crops and diseases. Compared to standard ELISA-based techniques it offers the potential to identify a number of diseases with just one test. It is essential to the crop industry that these techniques be available at a reasonable cost with a quick turn-around time. Coordination between all parties who will benefit from this type of service is necessary to move this technique from the research lab to the diagnostic lab.

Response:

During discussions at the OHCRSC meeting it became apparent that there is a need for grower access to PCR diagnostics across several commodity groups. There was a level of concern raised about funding research diagnostics that are not further utilized or accessible to Ontario growers. The OHCRSC would encourage OMAFRA to assist in bring identified agencies together to pursue the potential feasibility of providing this service to growers. Referred to OMAFRA, ARD and OMAFRA , Risk Management and UofG Lab Services.

Recommendation 19:

We recommend that AAFC open a new position in nematology, initially on a term basis if necessary, to attract a well-trained scientist and provide continuity in the nematology program.

Background:

This committee appreciates the valuable work of nematologists at Agriculture and Agri-Food Canada in Vineland. The nematology program has provided research results which are important to our industry, and we appreciate the knowledge base that has accumulated as a result of this program at Vineland. However, the full-time person years devoted to nematology research in Ontario has eroded from five down to one since 1984 and the remaining full-time nematologist

plans to retire in 2001. We are concerned about the continuity of the nematology program at Vineland.

We have submitted this recommendation a number of times and received affirmative replies that the position will be filled at the time of retirement of the current nematologist. However, given that there are few in North America with this expertise, we encourage AAFC to begin recruiting a new nematologist before the current nematologist retires.

Response: Referred to Dr. Gilles Saindon, AAFC

Recommendation 20:

That AAFC Vineland initiate a research program in the virology of berry crops.

Background:

Since Dr. Robert Martin, the berry crop virologist at AAFC Vancouver, left in 1993, there has not been research in berry crop virology in Canada. The Canadian raspberry and strawberry industry was worth \$87 million in 1999 (Statistics Canada). The farm value of the Ontario industry was \$22.7 million in 1999 (OMAFRA). National losses from virus diseases could be as high as \$20 million annually.

As AAFC Vineland has the mandate for pest control in fruit crops and Dr. Lorne Stobbs has the expertise, we would ask that berry crop virology become one of the priorities at AAFC Vineland.

Response: Referred to Dr. Gilles Saindon, AAFC

CRUCIFER CROPS

Recommendation 21:

In light of the urgent need for the rutabaga industry to address an increasing problem with cabbage maggot control options, the OCCRSC recommends to Agriculture and Agri-Food Canada Research Branch, London and to University of Guelph's Ridgetown College that a comprehensive research program be implemented for cabbage maggot management on rutabagas.

In addition the OCCRSC wishes to strongly remind the Pest Management Regulatory Agency of Health Canada that they must consider carefully any reviews of pest control products for rutabagas as there are presently no alternatives to currently labeled materials.

Background:

Directed to University of Guelph, Dept. of Plant Agriculture and RCAT and to Agriculture & Agri-Food Canada, Research Branch, London.

Rutabaga growers in Canada have lost access to cabbage maggot control options in the past several years leading to reliance upon only one group of insecticides, the organophosphates Lorsban and Counter. Both of these materials are under review by the Pest Management Regulatory Agency and may be lost or restricted for this use. In addition, the use of one group of organophosphates repeatedly will lead to insecticide resistance and loss of control.

The OCCRSC wishes to emphasize the urgency of the situation to PMRA of Health Canada, AAFC Research Branch and the University of Guelph's Ridgetown College which conducts rutabaga research at the Huron station. Until suitable alternatives can be developed and registered in Canada, it is vital that the PMRA maintain registration of currently labeled pest control options which are presently the minimum required.

A comprehensive research program that identifies and evaluates effective alternatives to currently labeled insecticides is urgently needed.

Response: Referred to Dr. Gilles Saindon, AAFC, Dr. Clarence Swanton, Department of Plant Agriculture, University of Guelph, Dr. Gary Ablett, Ridgetown College, PMRA.

Recommendation 22:

In light of the success of the Food Systems 2002 program to date, this committee wishes to convey to OMAFRA, ERLD the need to continue support towards research, which accomplishes the goals and philosophy of the FS2002 program. The goal of improved integrated vegetable crop management strategies leading to high quality food supplies requires a long-term and dedicated commitment. The OCCRSC wishes to request that annual funding for any new FS2002-like programs are returned to the \$800,000.00 level.

Background:

Directed to OMAFRA

During the course of the Food Systems 2002 program, many successful and economically sustainable research and development projects have led to significant improvements to IPM programs and pesticide reduction. According to recent figures, there has been a 30% reduction in the amount of pesticide used in Ontario and a concurrent 30% reduction in the risk associated with their use. It was also identified that further public resources be targeted to fruit and vegetable crops.

The development of IPM and more recently ICM (Integrated Crop Management) programs requires a stable and dedicated source of funding to ensure that new problems and serious on-going problems are addressed. In light of the general 'public good' that such programs have achieved to date, it is recommended that they be fully supported in the future.

Response: A review of FS2002 program is currently being undertaken by Crop Technology Branch, OMAFRA. This review will include an evaluation of the impact of the research funded under the FS2002 program. This response has been forwarded to Bill Ingratta, Director, Crop

Technology Branch, OMAFRA, and Dr. Larry Moore, Director Research Branch for further consideration and response back to the subcommittee.

Recommendation 23:

In light of impending legislation that will affect all producers of agricultural crops in Ontario, the Ontario Crucifer Crops Research & Services Committee requests that OMAFRA and Agriculture & Agri-Food Canada establish dedicated funding for research in the area of 'Nutrient Management Planning' specific to Ontario's horticultural crops including 'crucifer' crops.

Background:

Directed to OMAFRA and Agriculture & Agri-Food Canada

In order to be proactive, the Ontario Crucifer Crops Research and Services Committee recognizes the need for the development of detailed nutrient management profiles for all vegetable crops including 'crucifer' crops. To utilize crop nutrition inputs effectively and still maintain crop yields and quality an integrated crop fertility program must be developed which takes into account crop removal data, crop uptake data and growth stage models. New recommendations may be necessary which reflect the results of new research. By implementing such research now, a proactive, detailed and responsible nutrient management plan can be developed.

Response: The OHCRSC acknowledges that the need for research in nutrient management for all horticultural crops is a high priority and will recommend to OASCC to make research funding for nutrient management research and technology transfer a high priority.

Recommendation 24:

In light of the effects of the US FQPA and the current lack of true 'harmonization' (i.e. AgriMek, Actara, Success, Maxim, fipronil, etc., etc.), the Canadian and US registration systems need to more rapidly become North American in standards for crop protection. In addition, adequate funding to assist minor crops producers and researchers who must conduct trials to GLP standards is required in time for the 2001 growing season. Funding must cover the real project costs and not be limited to 50% for commodities that do not have the resources to finance such costly studies.

Background:

Directed to Agriculture & Agri-Food Canada, Policy Branch and to Health Canada, Pest Management Regulatory Agency

Researchers, extension personnel, industry and grower cooperators require adequate, consistent and stable funding to ensure completion of requirements under the minor use system. More flexibility with regard to funding minor use projects is required and more communication with the sponsors of minor use projects is needed. AAFC needs to seriously consider funding that addresses the needs of specific projects under GLP above and beyond the proposed 50% guideline.

Additionally, Canadian growers including Ontario cole crop growers, face serious repercussions from the US FQPA and loss of many of the currently registered pest control products. Because movement towards a 'level playing field' in North America is far too slow, Canadian growers will face a major competitive disadvantage. When a new active ingredient is accepted by the US EPA and is considered to be a new, 'reduced risk' alternative to older pest control products, the product should be available to Ontario growers at the same time. Unreasonable and costly additional studies seriously erode the ability of Ontario growers to compete in the world market and discourages companies from introducing new technologies to Ontario. US growers may lose many of their traditional pest control products, however many new alternatives are being evaluated and registered to replace them. The members of the Ontario Crucifer Crops Committee request that this issue be seriously addressed by the PMRA and that concrete results be forthcoming concurrently with the USA.

Response:

The OHCRSC will forward this recommendation related to harmonization to OPMRSC for response and an update on the status of progress in this area. The OHCRSC will also support recommendations made by the OPMRSC related to GLP funding and certification.

Recommendation 25:

It is strongly recommended that both the University of Guelph, Laboratory Services and Agriculture & Agri-Food Canada (London, St. Jean sur Richelieu) move to certify personnel and field station sites as GLP compliant in time for the 2001 growing season. If minor use residue trials are to be conducted in Canada, GLP certification is required. Without access to GLP compliant research field sites and personnel, minor use work will be seriously impeded. The delays in the minor use system already place Ontario growers at a disadvantage in the worldwide marketplace. Lack of access to GLP compliant sites will further slow the minor use process.

Background:

Directed to University of Guelph, Laboratory Services and Agriculture & Agri-Food Canada, London and St. Jean sur Richelieu.

Starting with the year 2001 growing season, all residue trials will have to be conducted as GLP compliant. A large number of minor use projects are proceeding or being planned for vegetable crops in the coming years. If the field stations we rely upon to conduct these trials are not GLP compliant, the trials cannot proceed and many minor uses may not be completed. Most minor uses are already delayed by funding problems and other PMRA requirements. In light of the US FQPA and several serious pest management problems in crucifer crops and other vegetables, the minor use system is the only mechanism available to address grower's concerns and the sustainability of the industry.

Response:

- ◆ The OHCRSC notes the progress made at the AAFC Greenhouse and Processing Research Centre, and University of Guelph (Simcoe and Kettleby) in undertaking GLP certification.
- ◆ The OHCRSC supports recommendations made by the OPMRSC related to GLP funding and

certification. The OHCRSC would encourage the collaboration of OMAFRA, University of Guelph and AAFC to make sure access to additional GLP compliant research field sites are available at research facilities across Ontario.

GINSENG

Recommendation 26:

Title: GLP

Therefore it is recommended that the Canadian Federal Government assist the agriculture community by providing the necessary funding to establish Canadian GLP compliant laboratories to provide residue testing at a reasonable, but subsidized, fee for service. This could be done with Provincial assistance.

Directed to: (Federal Agriculture Minister, Provincial Agriculture Minister)

Background: Funding to set up GLP compliance cannot be borne by growers. There is no venue to recover these costs in the marketplace. Assistance to do this is required. The USDA has provided funding to set up GLP compliant labs for residue testing and has done so with tax dollars.

Response:

In addition to GLP compliant research field sites, it is imperative to have GLP compliant lab facilities to support and facilitate the research efforts undertaken in Ontario. The OHCRSC supports recommendations made by the OPMRSC related to GLP funding and certification. The OHCRSC would encourage the collaboration of OMAFRA, University of Guelph and AAFC to make sure access to GLP compliant research field sites and laboratory facilities.

GRAPE & WINE

➤ Please note that arrows demark specific recommendations to address the issue

Recommendation 27:

Control of Powdery Mildew on Grapes

Background:

Powdery mildew was the number one pest problem on grapes in 2000. There were serious losses to individual growers with susceptible cultivars. The leaves and fruit clusters were heavily infested. Powdery mildew was estimated to impact by decreasing 20-30% of wine grape crop for 2000. Chardonnay was one of the hardest hit cultivars.

➤ **Dr. Gilles Saindon, Director of AAFC – SCPFRS**

Dr. Andy Reynolds, Research Chair CCOVI, Brock University

Additional research is required on periods of susceptibility and other epidemiological studies. There is still a need for research on potential fungicide resistance to powdery mildew involving the sterol inhibitor (e.g. Nova). This research should also examine the potential for cross-resistance to the new fungicides including Abound and Sovran.

➤ **Dr. Gilles Saindon, Director of AAFC – SCPFRS**

Dr. Andy Reynolds, Research Chair CCOVI, Brock University

There is also a need for research to support minor use and harmonization of control products that are available to our U.S. counterparts. Ontario grape growers require more information on the fit of newer fungicides (the strobilurins). Growers have a poor understanding in terms of control, resistance management strategies and spectrum of disease control.

- The Ontario Grape Growers' Marketing Board is recommending that a committee of specialists involving AAFC, OMAFRA, consultants and industry get together and formulate a powdery mildew strategy for the 2001 growing season.

Recommendation 28:

- ◆ Research Vacancies at Agriculture Canada, Vineland Station

➤ **Dr. Gilles Saindon, Director of AAFC – SCPFRS**

There are three vacant (or soon to be vacant) research positions that impact directly on the grape and tree fruit industries:

- The **entomology position (ecologist)** position has been vacant since late 1998. The initial request to fill this position was presented in 1998. It is our understanding that this position is still not filled. With important changes in pest complex and control options the ecology position is a critical component of the A-base entomology program. With new technologies such as disruptive pheromone technology, a reduction in available older chemistry (e.g. the FQPA re-evaluation process) and shifts in population dynamics (e.g. mites and leafhoppers on grapes) the fruit growers of Ontario rely strongly on this position.
- Dr. J. Northover retires in March 2001. This position has been a key position for **pathology** on both tree fruit and grapes. We encourage AAFC to refill this position as soon as possible. This position was clearly listed as a priority in the Plant Pathology Review of the Vineland AAFC program in January of 2000.
- The **nematology** position will also be vacant following the retirement of Dr. J. Potter. AAFC has committed to filling this position and maintaining technical support. No final decision on potential location of the position. We would encourage AAFC to fill this position as soon as possible.

Response:

- ◆ Referred to Dr. Gilles Saindon, AAFC

Recommendation 29:

- Good Laboratory Practices (GLP) Requirements for User Requested
Minor Use Label Expansion Program (URMULE) – Lack of
- ◆ Resources, Increased Costs and Funding Difficulties.

Background:

Starting in 2001 all new crop residue studies conducted in the field and laboratory need to be conducted under GLP. At present, there are no public institutions or universities that have site certification to conduct these types of trials. There are only 2 private companies in Ontario that have qualified staff and certification to conduct these trials. There is not enough resource capacity to meet the demand of projects identified or those that are presently in cue at the Pest Management Regulatory Agency. In addition the implementation of the new GLP guidelines means more research dollars will be required to conduct these labour intensive trials as a result of increased documentation requirements and the need for separate residue and efficacy studies. At the same time AAFC Policy, Ottawa is unilaterally proposing that the AAFC funding portion formula be reduced to a cap of up to 50% of the total cost of conducting each research residue project from the current 75%. The other 50% would come from other sources. More and more commodity groups are being expected to pick up the difference. However, horticultural commodities lack either the organizational leadership/mechanism and/or cash dollars to contribute to these important projects which gain access to new IPM tools.

➤ **Dr. Gilles Saindon, Director of AAFC – SCPFRS**

Dr. Gary Whitfield, Harrow Research Station

AAFC research branch support the efforts of field facilities (both resources and budget dollars) at both Vineland and Harrow to become certified (by June 2001) to conduct GLP trials for insecticides/fungicides/acaricides and herbicides respectively on fruit crops.

➤ **Dr. Deb Stark, ADM, OMAFRA**

Jim Chaput, OMAFRA Minor Use Co-ordinator

Bill Ingratta, Director of Crop Technology, OMAFRA

Craig Hunter, Pesticide Co-ordinator, OFVGA

Shirley Archambault, Canadian Horticulture Council

Bill Boddie, AAFC Policy Branch, Ottawa

Contract out to both AAFC facilities and private contractors for research residue projects.

AAFC policy funding remain at 75% of the value of a project. The other 25% be made up of a consortium of both cash and in-kind contributions from OMAFRA, and commodity groups.

National co-ordination and identification of projects to fund be completed in February to allow for researchers to be contracted by March of the year the trials are to be conducted. This would allow lead-time to obtain co-operators and ensure funding prior to the growing season and the beginning of the field project.

Both the OMAFRA minor use co-ordinator and the OFVGA provincial pesticide co-ordinator should play lead roles in provincial and national co-ordination.

Response:

- ◆ The OHCRSC supports recommendations made by the OPMRSC related to GLP funding and certification. The OHCRSC would encourage the collaboration of OMAFRA, University of Guelph and AAFC to make sure access to GLP compliant research field sites are available at research facilities across Ontario. The recommendation has also been forwarded to AAFC Policy Branch for further response.

Recommendation 30:

Impact of Pesticide Re-evaluation Regulations

USDA-EPA-Food Quality Protection Act (FQPA)

PMRA - Organophosphate Re-evaluation

Background:

The regulatory reviews and pesticide label revisions announced by the USA-Environmental Protection Agency, re: the Food Quality Protection Act, combined with Canada's Pest Management Regulatory re-evaluation of the organophosphate insecticides has the potential to adversely affect the grape industry. This is even more complicated when processors place additional restrictions on use as a result of consumer concerns, eg. restrictions on use of EBDC fungicides to pre-bloom only.

These reviews not only impact upon the organophosphate (OP) insecticides, but also on other pest control products as they come up for review, eg. the dicarboximides, Ronilan, Rovral. The Ontario Grape Growers' Marketing Board is concerned over the potential loss of OP's and carbamates, but a more serious consideration is the potential loss of fungicides including the EBDC's and selected sterol inhibitors.

The grape industry is dependent upon pest control products such as Guthion (azinphosmethyl), Sevin (carbaryl), and Rovral (iprodione). Ontario has an excellent track record on production of safe quality fruit produced through scientifically documented Best Management Practices including Integrated Pest Management (IPM). These programs have taken years to develop. The potential loss of key products through regulatory action or unrealistic restrictions on the use pattern would seriously impede the continued production of a safe, high quality product (including fresh, juice and wine grapes). Grape growers take very seriously the health and safety of the products they provide for consumers.

- **Bill Ingratta, Director, Crop Technology, OMAFRA**
Jim Chaput, Minor Use Coordinator, OMAFRA

Dr. Gilles Saindon, Director of AAFC – SCPFRS
Dr. Andy Reynolds, Research Chair CCOVI, Brock University

The OGGMB encourages research and extension personnel to continue to develop and refine viable and sustainable pest control strategies that are consistent with the objectives of IPM and risk reduction. We would encourage further work to evaluate the 'fit' of newer pesticide alternatives, and reduced risk products. We would also encourage additional research to demonstrate the 'fit' of older traditional products including azinphosmethyl, carbaryl and fungicides such as iprodione and the EBDC'S.

Research and technology transfer activities are required in the following areas:

1. The fit of newer fungicides, eg. Abound, Sovran, Flint, for control of grape diseases. Efficacy and fungicide resistance management strategies are required for Ontario growing conditions and cultivar mix.
2. A resistance management strategy for control of botrytis bunch rot including products such as Rovral, Elevate, Vanguard and Abound.
3. Initiate efficacy testing program on fungicides similar to insecticide/acaricide program already underway.
4. Research should continue on potential fungicide resistance to powdery mildew involving the sterol inhibitor (e.g. Nova). This research should also examine the potential for cross-resistance to the new fungicides including Abound and Sovran.
5. Need for research to support minor use and harmonization of control products that are available to our U.S. counterparts.
6. Research on OP and carbamate alternatives for control of grape berry moth.

Response:

- ♦ Referred to OPMRSC and to the agencies identified for further response.

Recommendation 31:

Availability of Pesticides and Grape Integrated Pest Management Program.



Background:

Both priorities 1,2 and 3 are part of this broader issue. The existence of materials registered in the USA and not in Canada is a constant source of frustration to growers, particularly juice grape growers because their product must cross the border. Not only does it put Canadian grape growers at a disadvantage; it puts the IPM research at a disadvantage. Not having the use of the materials in field scale experimental programmes makes it difficult to see how they fit in with the

existing materials and IPM strategies. It also makes it difficult to plan for resistance management if these new materials are prone to forcing resistant populations.

Materials not registered in the USA have a zero tolerance limit, but Canadian material has not been detained for residue infractions so far (other commodities have but not grapes). The review by EPA/FQPA and PMRA of organophosphates, the juice manufacturer's imposed restriction on EBDC's only before bloom, the possible removal/restriction of carbamate insecticides only make these restrictions more onerous and residues faults may be inevitable.

The whole integrated pest management strategy for grapes needs to be revisited. The materials available will always be in a state of flux, but the "fit" of the new ones in this general matrix must be determined. This means an ongoing review of IPM strategy and building into this strategy resistance management for powdery mildew and botrytis bunch rot control, taking into account new materials presently available in the USA that may already be developing resistant populations.

The production systems for grapes are changing, such that many tons are left hanging for late harvest and ice wine production. These late harvests may confound late season powdery mildew control because of fermentation interference and other means of late season powdery mildew control may have to be addressed.

The growing problem of European red mite is being addressed in part by the introduction of predatory mites into the vineyards, but the "fit" of this system with the newer pesticides is not known and must be integrated carefully into the grape IPM programme. In addition, potato and grape leafhoppers are also increasing in area vineyards, and new monitoring methods, thresholds and controls need to be developed. This holds true for other non-chemical methods of pest control such as pheromone disruption techniques.

- If recommendations were implemented in 1,2,3 and 4A this broader issue would be mostly addressed in part (see above).

Response: Referred to OPMRSC

Recommendation 32:

Cash Restrictions to Support Research Projects NEW

Background:

More and more research funding agencies are expecting commodity groups to supply cash as "seed money" for the project. Combined this may run up to substantial quantities of monies that producer groups are expected to contribute. At the present time it is not the mandate of most commodity boards or there is no mechanism to provide "seed money" for important research projects. Even if mechanisms were in place the dollars required would unlikely be readily/adequately available.

- **Research Dean University of Guelph**

Research Dean Brock University

Dr. Deb Stark, Assistant Deputy Minister, Research Division, OMAFRA

Dr. Bruce Archibald, Assistant Deputy Minister, Policy Division, OMAFRA

Jim Wheeler, Assistance Deputy Minister, Agriculture and Rural Division

Policy makers and managers of federal and provincial agencies along with university institutions i.e. Brock University and University of Guelph rethink existing funding guidelines and carefully consider before launching new future programs. Keep in mind that research funds in agriculture from producer organizations are limited when developing funding criteria and requirements.

➤ **Rod Stork, Chair of Ontario Farm Products Marketing Commission**

Dr. Bruce Archibald, Assistant Deputy Minister, Policy Division, OMAFRA

Farm Products Marketing Commission and OMAFRA Policy Advisors work together in strengthening commodity producer organizations to raise research dollars i.e. by developing mechanisms and expanding mandates such as establish research foundation and research check-offs.

Response: Research funding guidelines are established by the funding agencies sponsoring the research. Referred to the agencies identified for their response.

Recommendation 33:

Lack of Awareness/Co-ordination of Research Supporting Grape Industry

Background:

During our discussion amongst the GWRS subcommittee members, it became clear that various stakeholders are not aware of what each other's research and information programs/packages are. Growers and the competitiveness of the industry appear to be the biggest losers. With the splintering of research and extension/education programs among several institutions such as University of Guelph, Agriculture Agri-Food Canada, Brock University, OMAFRA and KCMS, there is no-longer a one stop shopping of information and research for the stakeholders of the industry including wineries and grape growers. Obvious information and resources do not always seem that available.

➤ **The chair of the Ontario Grape and Wine Research and Services Subcommittee will work as a facilitator:**

- 1) to get personnel from various institutions together once per quarter.
- 2) to ensure that all research institutions have focus/advisory groups that provide input to all active research institutions
- 3) a comprehensive list of research projects be made available to the grower community annually
- 4) compile and distribute to the grower community annually a comprehensive listing of what/where grape information is available
- 5) a more rigorous effort to publish research results in the Tender Fruit and Grape Vine newsletter

Response:

- ♦ The OHCRSC appreciates the efforts of the chair and the committee and agencies identified to work collectively to increase the coordination and awareness of research supporting the grape industry.

♦ Recommendation 34 :

Cost of Production Studies for Grapes

Background:

The "Grape Economic Information Study: Estimated Establishment Costs and Costs of Production in Ontario" is an extremely valuable information source for many stakeholders and the public. With vineyard acreage increasing in Niagara and in other areas such as Essex/Kent/Simcoe areas and in Prince Edward County, demand for information on grape production has increased. Many tender fruit growers and people contemplating starting wineries have requested information on the cost of producing grapes, before proceeding with establishing vineyards. The Ontario Grape Growers' Marketing Board, consultants and researchers regularly refer them to this publication. In addition, it is often utilized and quoted in many reports by growers, wineries and government, as it is considered a reliable and objective source of information. The last Grape Economic Information Study was completed in December 1997, but should be updated every four years.

Bill Ingratta, Director of Crop Technology

Jim Ashman, Director of Economic Development

Linda Franklin, Ontario Wine Council

Elizabeth Andreen, Ontario Grape Growers Marketing Board

- It is recommended that this report be updated in 2001, as it is a critical tool for the grape and wine industry.
- OMAFRA make it a high priority to revise and publish this valuable publication by the end of 2001.
- If OMAFRA resources are not available to do this in a timely fashion, a consortium of stakeholders including OMAFRA ensure that monies are available to contract the revision and publishing of this valuable and timely information for the grape industry.

Response: A committee has been formed and it is anticipated that the work will be completed in 2001. Referred to the agencies identified as well as to Mr. Dave Hope, Director Policy and Program Branch, OMAFRA and the Ontario Ag Economic Research and Services Committee and other agencies identified.

Recommendation 35 :

Snail problem

Background:

For the past 5 years snails have become an increasing problem in area vineyards. Initially the problem seemed to be in low input juice-grape vineyards. But snail problems are beginning to appear in well-managed vinifera wine grape vineyards. What happens is that snails migrate to the grape canopy for refuge and for food, and are mechanically harvested with the grapes. While it only impacts a handful of growers, the results can be devastating, "rejection of your crop by the processor!" Commercial baits available in the USA have some potential, but these products do not have a commercial pesticide label in Canada and are confined to small expensive domestic registration packaging i.e. Metaldehyde. Presently no researcher is interested or has the time/money to address this problem.

- Involves less than 10% of juice grape area
- Heaviest infestations more pronounced above escarpment, eg. St. Catharines (Short Hills area), above Grimsby, Winona.
- **In 1998 and 1999 a few loads were rejected by grape juice processors in New York. In 1999 a few New York growers also had loads rejected.**
- **Extremes in weather eg. the droughts of 1998-1999 and above average rainfall in 2000 all contribute to increased problems with snail infestations.**
- **Snails do not appear to feed directly on fruit or leaves but are a "contaminant" in the juice.**

Literature from other regions, eg. Australia lists snails as a pest that requires corrective interventions.

- Australia recommends Measulol and methaldehyde baits as well as suppressants including copper-based fungicides iron phosphates, and copper silicates.
- None of the above products are registered for use on grapes in Canada for control of snails.
- Measulol and methaldehyde baits are not considered environmentally friendly (methaldehyde baits are toxic to domestic cats and dogs as well as wildlife).
- Some initial work in the U.S. demonstrates that new alternatives including zinc or iron phosphates and copper-based fungicides are not effective control measures on their own. Successful control/suppression of snails requires an integrated approach involving more than one control option.

**Dr. Deb Stark, ADM, OMAFRA
Dean of Research, University of Guelph
Dean of Research, Brock University**

- Basic biological studies on snails life cycle and behavior (eg. are the vineyard residents or migrants, preferred hosts, triggers that encourage snails to move into grape plants)
- Incorporation of cultural practices including soil management (eg. discing) and vegetation management (eg. herbicide strips, comparisons of various weed management practices).

- Potential chemical alternatives to methaldehyde baits and Measurol.
 - Evaluation of single products and combinations of options.

Response:

- ◆ This is an identification of a void in research capacity. The OHCRSC would recommend that subcommittees try to address specific pest problems through expertise of its subcommittee members or by contacting research personnel to make them aware of this research priority.

Recommendation 36:

Time-line for Strategic Plan and Subcommittees

Representative from ERLD, OMAFRA reported at the meeting that OHCRSC and its subcommittees would need to report by November 1, 2001 or sooner to fall in line with the 4 year strategic plan review. This time-line will be very difficult to meet in the fall by several commodity subcommittees if we want industry stakeholder participation. In addition the complicated nature of the report and longer process will mean more time and essential training for the chairs and its subcommittees.

Dr. Deb Stark, Assistant Deputy Minister, Research Divison, OMAFRA

Larry Moore, Director of Research, OMAFRA

Jim Wheeler, Agriculture and Rural Division, OMAFRA

- ERLD to establish guidelines, procedures, and templates by February 15, 2001
- Training and facilitation for chairs by February 28, 2001
- Subcommittees will need greater commitment from OMAFRA technical and other staff with facilitation skills (such as Regional Information Co-ordinators and others) to ensure the process is successful.
- Some subcommittees will need to meet in March 2001 so that report is completed before the growing season commences.

Response: This issue was discussed with the OHCRSC subcommittee chairs and there are plans for a meeting and further training to assist in the planning and preparation for the OHCRSC Strategic Report. The chair of OHCRSC and the OMAFRA Research Analysts will be coordinating this process. The feedback of this committee is appreciated.

GREENHOUSE FLORICULTURE



Recommendation 37:

Title: To insure the viability of the Ontario greenhouse floriculture industry, it is recommended that the reinvestment of financial resources into personnel by Agriculture and Agri-Food Canada, University of Guelph and OMAFRA is essential if innovative research addressing production and pest management issues and effective "one-on-one" grower technology transfer is to continue. The industry has identified the following key positions:

The need is strong for a renewed commitment by AAFC to fund an ongoing indeterminate floriculture pest management programme consisting of at least two permanent positions, an entomologist and pathologist. These two individuals are needed to address ever-changing pest concerns such as Western Flower Thrips and Silver Leaf Whitefly and to supervise industry/MII/CanAdapt funded projects. (The industry feels that there is great value in having research carried out at different research institutions because the focus of the research programmes can be totally different ie long-term generic basic research versus basic with a more applied scope.)

The industry appreciates the fruitful discussions with OMAFRA and the University of Guelph regarding the commitment to fill the faculty position in production-oriented floriculture vacant since the retirement of Dr. M. J. Tsujita because of the wide range of crops, production systems in Ontario floriculture and to integrate the physiology-based basic research presently underway with the production perspective;

The industry, while appreciating the financial restraints within OMAFRA that has resulted in a change in focus and mandate, considers it important for OMAFRA to continue the same level of support to greenhouse floriculture technology transfer by filling the Greenhouse Floriculture specialist position lost with the retirement of John Hughes in December of 1998. The industry over the next year will endeavour to investigate and discuss potential funding formulas with OMAFRA.

Background:

During the past year the industry has been attempting to develop a comprehensive vision on the level and direction of research and technology transfer they as an industry would like to see the University of Guelph and both levels of government provide. As an industry they feel they should or need to be more involved in the direction of research. However, they also realise that funding or financial support by the industry is an issue. To achieve these goals, the industry appreciates the meaningful discussions that have occurred with OMAFRA, the University of Guelph Department of Plant Agriculture and Agriculture and Agri-Food Canada.

The floriculture industry continues to be concerned with what appears to them to be the slow erosion of support/commitment by both the federal and provincial governments and the University of Guelph to long term, ongoing research and technology transfer.

The industry has continued over the past 10-15 years to expand at the rate of 8-10% annually even when much of the economy was in severe recession. The value of the production sector of the industry in 1999 was reported as \$516 million by Statistics Canada. The industry is now one of the largest in horticulture, yet is one where financial support through research continues to be disproportionately small compared with farm gate values of other horticultural crops. It and woody ornamentals are the only two agricultural crops where sales tax revenue is generated from the sale of their farm gate product. The industry has experienced phenomenal growth in export trade during the 1990's to the United States in both potted plants and cut flowers (\$241 million in '99). For the past number of years a significant positive trade balance has existed.

The Ontario greenhouse floriculture sector is a recognised leader in crop production techniques and growing structure design in North America. Researchers and growers alike visit Ontario to study how the industry produces quality floral products so competitively priced. Floriculture, however, is a unique horticultural crop in the following ways. Firstly, the products are generally not considered edible; they only make the world a more beautiful place to live and work. Secondly, it is the only sector other than woody ornamentals where both levels of government gain revenue directly through sales taxes; the federal government through GST and the provincial government through PST. These revenue contributions are significant but the industry sees little re-investment into one of the most vibrant agricultural sectors.

Response

It is the understanding of the committee that the process for filling the University of Guelph faculty position is under way. The OHCRSC would encourage Flowers Canada (Ontario) to pursue further joint discussions directly with the agencies identified.

GREENHOUSE & PROTECTED CROPS

Recommendation 38

WHEREAS,

The members of the Ontario Greenhouse & Protected Crops Research and Services Subcommittee of the OHCRSC are grateful to the Department of Plant Agriculture, University of Guelph, for filling the faculty position on greenhouse vegetables at the Vineland Station Campus

IT IS RECOMMENDED THAT:

The status quo of: "10% teaching, 90% research and extension" for the faculty position on greenhouse vegetables, in Vineland, be maintained.

Response: The OHCRSC would suggest that the subcommittee or appropriate industry organization contact Dr. Clarence Swanton directly to confirm the time allocation assigned to this faculty position for teaching, research and extension. This recommendation has also been referred to Dr. Swanton.

LOW ACREAGE CROPS

Recommendation 39:

That immediate funding be made available to producers and researchers of low acreage and special crops for conducting trials to GLP standards. Such funding to be in place in time for the 2001 growing season and to cover total cost and not limited to 50 per cent for low acreage and special crop commodities that do not have the financial resources to fund such costly studies. Furthermore, the Canadian and US registration systems need to be harmonized more quickly and become North American in standards for low acreage and special crops protection. Directed to Agriculture and Agri-Food Canada, Health Canada, (PMRA)

Response:

- ♦ The OHCRSC will also support recommendations made by the OPMRSC related to GLP funding and certification. The OHCRSC would encourage the collaboration of OMAFRA, University of Guelph and AAFC to make sure access to GLP compliant research field sites are available at research facilities across Ontario.

Recommendations 40:

That GLP certification of personnel and field station sites be finalized in time for the 2001 growing season. GLP certification through University of Guelph, Laboratory Services and Agriculture and Agri-Food Canada (London), (St. Jean sur Richelieu) must be certified if minor use trials are to be conducted in Canada. A shortage of GLP compliant locations will impede the minor use process and place Ontario producers of low acreage and special crops at a further disadvantage in the ever-competitive global market place. Directed to Agriculture and Agri-Food Canada, London and St. Jean sur Richelieu and University of Guelph, Laboratory Services.

Response:

- ♦ The OHCRSC will also support recommendations made by the OPMRSC related to GLP funding and certification. The OHCRSC would encourage the collaboration of OMAFRA, University of Guelph and AAFC to make sure access to GLP compliant research field sites are available at research facilities across Ontario.

Recommendation 41:

That variety evaluation trials for low acreage and special crops be continued and enhanced. Such trials to include GMO varieties. This work is vital for Ontario producers to be competitive in the market place and for continued economic viability of the agri-business community.

Directed to Agriculture and Agri Food Canada and University of Guelph, Department of Plant Agriculture.

Response: Forwarded to Dr. Gilles Saindon, AAFC , Dr. Gary Whitfield, AAFC Harrow, Dr. Clarence Swanton, University of Guelph., Dr. Gary Ablett, Ridgetown College and Dr. Bill Curnoe, Kemptville College.

Recommendations 42:

That given the great potential impact that nutrient management planning legislation may have on low acreage and special crops priority be given to financially support research in crop nutrition and nutrient management.

Directed to Agriculture and Agri-Food Canada and OMAFRA.

Response:

- ◆ The OHCRSC acknowledges that the need for research in nutrient management for all horticultural crops is a high priority and will recommend to OASCC to make research funding for nutrient management research and technology transfer a high priority. This recommendation will also be forwarded to the OSWARC committee.

Recommendations 43:

That with the ever increasing incidence of pest pressure and on farm environmental issues pertaining to nutrient management, air and water quality, food safety and producer liability, research and technology transfer be enhanced in the area of post harvest produce handling of low acreage and special crops.

Directed to OMAFRA, University of Guelph, Agriculture and Agri Food Canada.

Response:

- ◆ There have been several new positions established in Crop Technology Branch, OMAFRA including specialist positions in Nutrient Management- Hort Crops, On-Farm Food Safety , Fresh Market Quality (post harvest focus) and IPM for Specialty Crops that will be working to address these issues in horticultural crops. Also referred to Dr. Gilles Saindon, AAFC, Dr. Clarence Swanton, Department of Plant Agriculture, University of Guelph and Dr. Gwen Zellen, OMAFRA

Recommendations 44 :

That the Muck Crops Research and Services Committee be renamed "Allium, Carrot and Leafy Vegetable Research and Services Committee". This new structure to include producers , industry and researchers familiar with all soil types (mineral and muck) thus avoiding duplication and improving the OASCC process.

Directed to OMAFRA and OASCC

Response: The OHCRSC directs this recommendation to the chair of the Muck Crops Research and Services Committee for discussion and consideration by the subcommittee.

MUCK CROPS

Recommendation 45:

In light of impending legislation that will affect all producers of agricultural crops in Ontario, the Ontario Muck Crops Research & Services Committee requests that OMAFRA and Agriculture & Agri-Food Canada establish dedicated funding for research in the area of 'Nutrient Management Planning' specific to Ontario's horticultural crops including 'muck' crops.

Background:

In order to be proactive, the Ontario Muck Crops Research and Services Committee recognizes the need for the development of detailed nutrient management profiles for all vegetable crops including those grown on muck soils. To utilize crop nutrition inputs effectively and still maintain crop yields and quality an integrated crop fertility program must be developed which takes into account crop removal data, crop uptake data and growth stage models specific to muck soils. New recommendations may be necessary which reflect the results of new research. By implementing such research now, a proactive, detailed and responsible nutrient management plan can be developed.

Response:

- ◆ The OHCRSC acknowledges that the need for research in nutrient management for all horticultural crops is a high priority and will recommend to OASCC to make research funding for nutrient management research and technology transfer a high priority.

Recommendation 46:

In light of the effects of the US FQPA and the lack of true 'harmonization' in availability of currently registered pesticide products in both the US and Canada, the Canadian and US registration systems need to more rapidly become North American in standards for crop protection.

In addition, adequate funding to assist minor crops producers and researchers who must conduct trials to GLP standards is required in time for the 2001 growing season. Funding must cover the real project costs and not be limited to 50% for commodities that do not have the resources to finance such costly studies.

Background:

Canadian growers including Ontario muck crop growers, face serious repercussions from the US FQPA and loss of many of the currently registered pest control products. Because movement towards a 'level playing field' in North America is far too slow, Canadian growers will face a major competitive disadvantage. When a new active ingredient is accepted by the US EPA and is considered to be a new, 'reduced risk' alternative to older pest control products, the product should be available to Ontario growers at the same time. Unreasonable and costly additional studies seriously erode the ability of Ontario growers to compete in the world market and discourages companies from introducing new technologies to Ontario. US growers may lose

many of their traditional pest control products, however many new alternatives are being evaluated and registered to replace them. The members of the Ontario Muck Crops Committee request that this issue be seriously addressed by the PMRA and that concrete results be forthcoming concurrently with the USA.

Researchers, extension personnel, industry and grower cooperators require adequate, consistent and stable funding to ensure completion of requirements under the minor use system. More flexibility with regard to funding minor use projects is required and more communication with the sponsors of minor use projects is needed. AAFC needs to seriously consider funding that addresses the needs of specific projects under GLP above and beyond the proposed 50% guideline.

Response: The OHCRSC will forward this recommendation related to harmonization to OPMRSC for response and an update on the status of progress in this area. The OHCRSC will also support recommendations made by the OPMRSC related to funding and certification.

Recommendation 47:

Integration and cooperation between OMAFRA and the OF&VGA's AIMS organization is required in order to ensure that all growers of horticultural crops in Ontario, including muck crops, have access to complete crop scouting services. Services must include crop evaluation at harvest.

Background:

With the loss of the OMAFRA IPM Scouting program, there is a need for high quality crop scouting services to be available to growers. AIMS has stepped in to provide these services, and AIMS is encouraged by this committee to further expand the services that they offer to Ontario growers. In addition, the cooperation of OMAFRA is requested in providing training of crop scouts and other technical support to AIMS.

Response: Managers and staff of OMAFRA Crop Technology Branch are working closely with the AIMS organization. Ministry staff will provide technical expertise in the development of pest management strategies and in training and education efforts. The OHCRSC would encourage the committee to contact Mr. Stuart McCann Business Manager, AIMS to discuss the types of services crop scouting/crop evaluation services that are of interest to growers.

Recommendation 48:

It is strongly recommended that both the University of Guelph, Laboratory Services and Agriculture & Agri-Food Canada (London, St. Jean-sur-Richelieu) move to certify personnel, field station sites and laboratory facilities as GLP compliant in time for the 2001 growing season. If minor use residue trials are to be conducted in Canada, GLP certification is required. Without access to GLP compliant research field sites, analytical laboratories, and personnel, minor use work will be seriously impeded. The delays in the minor use system already place Ontario

growers at a disadvantage in the worldwide marketplace. Lack of access to GLP compliant sites will further slow the minor use process.

Background:

Starting with the year 2001 growing season, all residue trials will have to be conducted as GLP compliant. A large number of minor use projects are proceeding or being planned for vegetable crops in the coming years. If the field stations we rely upon to conduct these trials are not GLP compliant, the trials cannot proceed and many minor uses may not be completed. In addition, the lack of GLP-certified analytical laboratories in Ontario greatly impedes the progress and completion of minor use projects and submissions to PMRA. Most minor uses are already delayed by funding problems and other PMRA requirements. In light of the US FQPA and several serious pest management problems in muck crops and other vegetables, the minor use system is the only mechanism available to address grower's concerns and the sustainability of the industry.

Response:

The OHCRSC will forward this recommendation related to harmonization to OPMRSC for response and an update on the status of progress in this area. The OHCRSC will also support recommendations made by the OPMRSC related to GLP funding and certification.

Recommendation 49:

PCR diagnosis of aster yellows in leafhoppers should be made available to Ontario vegetable growers through the Pest Diagnostic Clinic, University of Guelph. The Pest Diagnostic Clinic is requested to inform this committee of the reasons for not offering this diagnostic service to Ontario growers.

Background:

The methodology for detecting the aster yellows phytoplasma in leafhoppers has been available for a number of years. This research was conducted at the University of Guelph and was partially funded by OMAFRA through Food Systems 2002. This technology is essential to help growers make optimal management decisions on a timely basis. Growers have expressed willingness to pay for this service, but it is not offered through the Pest Diagnostic Clinic. In other jurisdictions, this technique has been made available to growers free-of-charge.

Response:

During discussions at the OHCRSC meeting it became apparent that there is a need for grower access to PCR diagnostics across several commodity groups. There was a level of concern raised about funding research diagnostics that are not further utilized or access to Ontario growers. The OHCRSC would encourage OMAFRA to assist in bring identified agencies together to pursue the potential feasibility of providing this service to growers. Referred to OMAFRA, ARD and OMAFRA , Risk Management and UofG Lab Services.

NURSERY, LANDSCAPE & TURFGRASS

Recommendation 50:

Title: Pesticides And Integrated Pest Management- Research / Service

The subcommittee on Nursery, Landscape and Turf recommends continued support for research into pesticides and integrated pest management in turf and nursery/landscape production, particularly the development of low risk alternatives to current pesticides.



Background:

Between the increasingly restrictive regulatory climate (e.g. municipal and federal pesticide ban initiatives), the loss of problematic chemicals such as organophosphate insecticides, the cost and slow speed of developing new chemistries for control, and difficulties in the harmonization process for pesticide registrations, there is increasing need for research into integrated pest management approaches. Monitoring methods, thresholds, and alternative low risk management methods and materials are all reasearch areas which need to be encouraged, to ensure that the nursery/landscape and turf industries are able to continue to maintain the quality of production.

Response:

The OHCRSC is aware that the PMRA has recently formed the Healthy Lawns Working Group to develop a national action plan for pesticide reduction and reduced risk alternatives in urban landscapes. Landscape Ontario has also proposed an industry IPM certification plan. Research support to address IPM needs for turf and nursery/landscape would be beneficial to support these initiatives. Also referred to OPMRSC.

Recommendation 51:

Title: Improved Understanding of Plum Pox Virus - Research

The subcommittee on Nursery, Landscape and Turf recommends continued support for research into the biology and management of the plum pox virus

Background:

The effect, both actual and potential, of the plum pox virus will be significant in the nursery/landscape industry, as crops such as sand cherry are identified as potential carriers and subject to quarantine and destruction. There is a need for rapid improvement in our understanding of this disease, particularly the epidemiology and host range, so that control may be effective without inflicting severe economic impacts unnecessarily. Accurate surveys of the spread of the disease and understanding of the potential for genetically resistant *Prunus* types, as well as certification of resistant material, will be important in this regard.

Response:

Referred to Bob Carberry, Executive Director, CFIA. The OHCRSC would also encourage the Nursery Landscape Turf subcommittee to work closely with the Tender Fruit subcommittee as this is a priority that has been identified in both sectors.

Recommendation 52:

Title: Water Use And Management - Research / Service

The subcommittee on Nursery, Landscape and Turf recommends continued support for research into water use and water management in turf and nursery/landscape production, as well as education and extension of the information to the producers.

Background:

The combination of increased demand for high quality turf and landscape production, increased awareness of potential sensitivity of water systems to shortage or pollution, and long-term changes in climate and weather (including extended drought periods in 1998 and 1999 and the Walkerton water problems in 2000) have led to the identification of water use and management research as a high priority. Areas which could be addressed by this research priority include - on the input side: irrigation scheduling and delivery systems; fertigation and other injection systems; the effects of water quality on turf or nursery production; use of grey water or recycled water for irrigation; nutrient recycling; and development of low water use systems through cultivar selection or management methods. On the output side research could address runoff and leaching of nutrients or pesticides; groundwater protection; and the net effects of turf or landscape systems on the water balance in managed landscapes.

Because water problems appear to be moving from chronic to acute in many nursery and turf operations, timely and efficient transfer of information arising from this research is vital.

Response:

This is an ongoing priority identified by OSWARC. The OMAFRA Nursery Crops Specialist and the OMAFRA Turfgrass Specialist will include this topic/issue in development of education/tech transfer initiatives. The Guelph Turfgrass Institute also holds a Water Use Workshop.

Referred to OSWARC and to Randy Jackiw, Director Resources Management, OMAFRA.

Recommendation 53:

Title: Coordination of Tech Transfer / Information Tools - Service

The subcommittee on Nursery, Landscape and Turf recommends that priority be given to using and coordinating the use of the most up-to-date approaches and technologies, including (for example) Internet systems, to deliver research information and interpretation in support of industry.

Background:

The solution to many problems in the nursery, landscape and turf industry is timely and accurate transfer of current and available information to the end-user. In the context of ever-increasing use of new technologies and approaches to accumulating, indexing, interpreting and transferring such information, this committee feels that a high priority should be placed on these improved research interpretation and technology transfer systems. There is likely to be a significant gain from investment in improvements to the interface between a large body of pertinent research information and the end-user who often does not have the time or competence to access it directly.

Details:

The objective of this recommendation is to identify the need to make full use of the potential for new technologies and delivery systems to interpret and transfer research information to the industry. This can include both new positions or task priorities in support of such transfer and improvements in hardware, software, and library or database development. Of particular importance, in light of the development of web sites and online databases, is the coordination of numerous sources of information through indexes, search engines, and cross-referencing.

Response: This appears to be a priority versus a recommendation. The OHCRSC would encourage committee members to initiate further discussion and action on this recommendation.

SWEET CORN**Recommendation 54:**

Increase the funding available to the minor use registration process in order to allow more pest control products to move through the system.

Response: Referred to the OPMRSC.

Recommendation 55:

Encourage the PMRA and OMAFRA to continue to work with the EPA and IR4 in order to reduce the inconsistencies in availability of pesticides between Ontario and US producers.

Response: The OHCRSC will forward this recommendation related to harmonization to OPMRSC and PMRA for response and an update on the status of progress in this area. The OHCRSC will also support recommendations made by the OPMRSC related to GLP funding and certification.

Recommendation 56:

Funding be made available/redirected in order to address research concerns stemming from the upcoming nutrient management planning legislation and regulations

Response:

The OHCRSC acknowledges that the need for research in nutrient management for all horticultural crops is a high priority and will recommend to OASCC to make research funding for nutrient management research and technology transfer a high priority.

POTATOES

Recommendation 57:

Title: Lack of Harmonization of US and Canadian Registration Systems.

Details: In light of the effects of the US FQPA and the current lack of true pesticide registration harmonization, the Canadian and the US registration systems need to more rapidly become North American in standards for crop protection

Response: The OHCRSC will forward this recommendation related to harmonization to OPMRSC and PMRA for response and an update on the status of progress in this area. The OHCRSC will also support recommendations made by the OPMRSC related to GLP funding and certification.

TOMATOES

Recommendation 58:

Aging demographics of scientific community. In order to maintain program integrity, a succession plan for scientific expertise and for research support must be developed. The subcommittee views the aging demographics of staff as a future barrier to program delivery. With the influx of term and casual employees under externally funded projects, the recruitment and maintenance of core expertise to propose and direct appropriate research initiatives is essential. Furthermore, we recommend that the weed science position at Ridgetown College be filled as soon as possible. This recommendation should be directed to AAFC and Univ. of Guelph.

Response: Referred to Dr. Gary Whitfield, AAFC Harrow and Dr. Gary Ablett, Ridgetown College.

Recommendation 59:

Nutrient Management Plan. Given the high potential impact that nutrient management planning legislation may have on the tomato industry, this committee recommends that public funding programs aimed at promoting nutrient management research be developed. This recommendation should be directed to OMAFRA and AAFC.

Response: The OHCRSC acknowledges that the need for research in nutrient management for all horticultural crops is a high priority and will recommend to OASCC to make research funding for nutrient management research and technology transfer a high priority.

Recommendation 60:

Access to crop protection materials. The industry continues to have difficulties with situations where pesticides are registered in the U.S. but not registered in Canada. Canadian growers are often denied (or delayed) access to newer, safer and biocontrol materials. Imported produce from the US is often treated with the products denied to Canadian farmers. The implementation of the Food Quality Protection Act in the US will mean that some of the older materials will no longer be available or that produce treated with these products cannot be exported to the US.

Actions required include:

- speeding up the registration process.
- harmonization of pesticide registration in the U.S. and Canada.
- providing adequate funding for the URMULE and URMUR programs.(Direct to PMRA & Policy Branch, OMAFRA)

Response:

- ♦ The OHCRSC will forward this recommendation related to harmonization to OPMRSC for response and an update on the status of progress in this area. The OHCRSC will also forward to PMRA and Policy Branch, OMAFRA for response. The OHCRSC would appreciate if summaries of any meetings on these issues could be forwarded to the chair of OHCRSC to circulate to subcommittee chairs as this information would be relevant to all of the subcommittees.

TENDER FRUIT

Recommendation 61:

The TFRSSC recommends a coordinated effort to eradicate plum pox virus in stone fruits in Ontario.

Background:

Plum Pox Virus (PPV), the most serious disease of *Prunus*, affecting peaches, nectarines, European and Japanese plums and apricots, but NOT sweet or sour cherries, was first discovered in Ontario and Canada in 2000. In an extensive survey of susceptible *Prunus* orchards, nurseries, mother blocks and homeowners conducted by the Canadian Food Inspection Agency (CFIA) in 2000, virus-infected trees were found throughout the major production areas of the Niagara peninsula as well as Norfolk and Kent counties. While the disease can be spread by aphids, a propagation linkage was also established primarily with processing cling peach cultivars. The fact that this disease has become well established in Niagara and has been found in

other tender fruit growing regions of Ontario indicates that long term plans must be made to eradicate the disease. Strong actions are required by all players to assure that PPV does not spread further and, in fact, does not become a limiting factor in tender fruit production in Ontario and Canada. As this is an evolving problem with national and international significance, the TFRSSC has ranked this recommendation as its highest priority.

Response:

This recommendation has been forwarded to Dr. Bob Carberry, Executive Director, CFIA. The OHCRSC would encourage the Tender Fruit and Nursery, Landscape and Turf to work together as this is a priority that has been identified in both sectors.

Recommendation 62:

The TFRSSC recommends that the University of Guelph, Department of Plant Agriculture, staff the stone fruit breeding position and the tender fruit orchard management position at Vineland Station

Response:

Referred to Dr. Clarence Swanton, Dept. of Plant Agriculture, University of Guelph

Background:

Currently, the strength of the tender fruit industry has come from the new cultivars developed from Vineland breeding programs and the local recommendations from research for best management practices for Ontario conditions. The importance to the growers and the entire industry to keep these positions not only as a research and teaching position, but also to continue to interact with both industry and extension. This is a re-submission of TFRSSC recommendation 99-3 (OHCRSC 34)

Recommendation 63:

The TFRSSC recommends that OMAFRA Policy Branch assist the TFRSSC and OTFPMB in an interim survey of trends on tree fruit plantings

Response:

Referred to Mr. Dave Hope, Director, OMAFRA Policy and Farm Finance Division

Background:

OMAFRA currently conducts a full tender fruit tree census every 5 years but the industry feels that an interim survey would greatly improve the orderly marketing of tender fruits by matching supply with demand. In accordance with the Ontario Fruit Advisory Committee's Business Plan 5.5.2, a bi-annual tree survey would assist the industry in identifying planting trends in the industry, identifying shortages and surpluses of each fruit commodity; forecasting actual production to best match store promotions and assist shipper/dealers accurately in matching supply of fresh fruit with demand. This is a revision and re-submission of TFRSSC recommendation 99-2 (OHCRSC 33).

Recommendation 64:

Review by PMRA, FQPA Impact and Identification of High Priority Pest Control Products and Potential Alternatives

Response:

Referred to OPMRSC and PMRA. The OHCRSC would appreciate if summaries of any meetings on these issues could be forwarded to the chair of OHCRSC to circulate to subcommittee chairs as this information would be relevant to all of the subcommittees.

Background:

The current reviews impact particularly upon the organophosphate insecticides, but as any older pesticide product comes up for review, it must comply with the new regulatory procedures outlined in the FQPA. We need to review the FQPA document that was prepared in 1998 for PMRA and to update the document to identify key pest control products including insecticides, miticides and fungicides and evaluate the impact of potential loss of registration, alternatives and IPM fit. In particular it is anticipated that the next stage of the FQPA review will include fungicides (especially EBDCs, sterol inhibitors and Rovral). The review should also identify products available in the U.S. but not registered in Canada. The review should involve representatives from OMAFRA, AAFC and the OTFPMB.

Recommendation 65:

The TFRSSC recommends that OMAFRA provide support and resources for the TFRSSC to update the OMAFRA Publication 430, Fruit Cultivars and provide support for posting the revised version on the OMAFRA web page

Background:

New cultivars introduced from breeding programs at Vineland, Harrow, and elsewhere in the world, have been tested and found suitable for Ontario conditions. The Fruit Cultivars publication needs to be updated in both paper and electronic form for all tender fruit producers in Ontario. The importance to the growers and the entire industry to keep growers informed through unbiased OMAFRA publications continues to be a high priority with industry.

Response: OMAFRA Crop Technology ministry staff will work with the editors of this publication to coordinate posting of fruit cultivar updates on the ministry website.

Recommendation 66:

The TFRSSC recommends that OMAFRA develop guidelines for nutrient management plans for tender fruit trees.

Background:

Environmental Farm Plans required for farm operations will include a nutrient management plan. There are few guidelines for perennial crops, such as tender fruits. Pending provincial legislation

may impact on use of manure and other organic amendments in orchards. Nutrient management plans were identified as an emerging issue in the 1999 report.

Response:

The OHCRSC acknowledges that the need for research in nutrient management for all horticultural crops is a high priority and will recommend to OASCC to make research funding for nutrient management research and technology transfer a high priority. This recommendation will also be forwarded to OSWARC.

Recommendation 67:

The TFRSSC recommends that CFIA, OTFPMB, OMAFRA, AAFC, OFTA and nursery operators develop a plan for the introduction of a nursery certification program for tender fruit.

Background:

The plum pox virus situation has identified weaknesses in current propagation practices for tender fruit trees, and has left the industry without an adequate source of virus-tested budwood for propagation. In the past, propagators have relied on budwood from non-virus-tested trees in commercial orchards for at least 50% of their requirements. It is essential that trees planted in the future are free from viruses especially plum pox. With the removal of virus-infected trees and orchards, a major replanting program is anticipated.

Response:

Referred to Blake Ferguson, CFIA Wayne Roberts, OTFPMB, Bill Ingratta, OMAFRA Crop Technology, Dr. Gilles Saindon, AAFC, Dr. Gary Whitfield, AAFC and OFTA.

Recommendation 68:

The TFRSSC recommends that AAFC-Vineland continue to provide crop protection research and support to the tender fruit industry by the timely staffing of positions in entomology, pathology and nematology.

Background:

The entomology position has been vacant for some time, and the pathology and nematology positions are the subject of upcoming retirements. The TFRSSC recommends that staffing action be initiated and completed so that the positions in entomology and pathology are filled prior to the 2001-growing season.

Response:

Referred to Dr. Gilles Saindon, AAFC

APPENDIX

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ALPHABETICAL LIST OF ABBREVIATIONS

AAFC	Agriculture and Agri- Food Canada
ABPV	Acute Bee Paralysis Virus
AFLS	Agri- Food Laboratory Services
BC	British Columbia
CANGO	Commercial Association of Nut Growers of Ontario
CFIA	Canadian Food Inspection Agency
CHC	Canadian Horticultural Council
CPB	Colorado Potato Beetle
CITES	Convention of International Trade of Endangered Species
CRESTech	Centre for Research in Earth and Space Technology
CTGA	Christmas Tree Growers' Association
CWI	Canadian Wine Institute
DFVIIB	Dairy, Fruit and Vegetable Industries Inspection Branch
EFP	Environmental Farm Plan
ERM	European Red Mite
FP&I	Food Production and Inspection Branch
GGAC	Ginseng Growers' Association of Canada
GTI	Guelph Turfgrass Institute
GUARD	Guelph Alumni Research and Development
GWM	Greater Wax Moth
HBTM	Honey Bee Tracheal Mites
IDFTA	International Dwarf Tree Association
HES	Horticultural Experiment Station
HRIO	Horticultural Research Institute of Ontario
IPM	Integrated Pest Management
KCUG	Kemptville College, University of Guelph
MFTIP	Managed Forest Tax Incentive Program
NAFTA	North American Free Trade Agreement
NFGA	Norfolk Fruit Growers Association
NOTL	Niagara- on- the- Lake
NPFVGA	Niagara Peninsula Fruit and Vegetable Growers' Association
NLARS	New Liskeard Ag. Research Station
OAGMB	Ontario Asparagus Growers' Marketing Board

OAMC	Ontario Apple Marketing Commission
ΩASCC	Ontario Agricultural Services Coordinating Committee
OBA	Ontario Beekeepers' Association
OBLR	Oblique Banded Leaf Roller
OBGA	Ontario Berry Growers' Association
OCPC	Ontario Crop Protection Committee
OFM	Oriental Fruit Moth
OFTA	Ontario Fruit Tree Association
OFVGA	Ontario Fruit and Vegetable Growers' Association
OGGMB	Ontario Grape Growers' Marketing Board
OGVPMB	Ontario Greenhouse Vegetable Producers' Marketing Board
OHCRSC	Ontario Horticultural Crops Research and Services Committee
OMAFRA	Ontario Ministry of Agriculture, Food and Rural Affairs
OMNR	Ontario Ministry of Natural Resources
OMSPA	Ontario Maple Syrup Producers' Association
ONTA	Ontario Nursery Trade Association
OPA	Ontario Pollination Association
OPMRSC	Ontario Pest Management Research and Services Committee
OSCIA	Ontario Soil and Crop Improvement Association
OTFPMB	Ontario Tender Fruit Producers' Marketing Board
OTSPGMB	Ontario Tomato Seedling Plant Growers' Marketing Board
OWSOA	Ontario Woodlot and Sawmill Operators' Association
PDC	Pest Diagnostic Clinic
PED	Potato Early Dying
PIB	Plant Industry Branch
PLRV	Potato Leaf Roll Virus
PMRA	Pest Management Regulatory Agency
PMRC	Pest Management Research Centre
RCUG	Ridgetown College, University of Guelph
SCPFRC	Southern Crop Protection and Food Research Centre
TAGGBC	The Association of Ginseng Growers of British Columbia
TSSM	Two-Spotted Spider Mite

TuMV
UofG
URMULE
US
USDA
VQA
WCO
WWF

Turnip Mosaic Virus
University of Guelph
User Requested Minor Use Label Expansion
United States
United States Department of Agriculture
Vintners' Quality Alliance
Wine Council of Ontario
World Wildlife Fund

ONTARIO HORTICULTURAL CROPS RESEARCH AND SERVICE COMMITTEE 2000-2001

Anderson, Annette Chair	OMAFRA	Ontario Ministry of Agriculture, Food, Rural Affairs Crop Technology 1 Stone Rd. West Guelph, ON, N1G 4Y2	Phone: 519-826-3286 Fax: 519-826-3567 aanders@omafra.gov.on.ca
Paul Brine	OMAFRA	OMAFRA Research Analyst 1 Stone Rd. West 4 th Floor NW Guelph, ON, N1G 4Y2	Phone: 519-826-4162 Fax: 519-826-4211 pbrine@omafra.gov.on.ca
Pitblado, Ron	U of G	Ridgetown College, University of Guelph Main Street East Ridgetown, ON, N0P 2C0	Phone: 519-674-1605 Fax: 519-674-1600 rpitblad@ridgetownc.uoguelph.ca
Clarence Swanton	U of G	Department of Plant Science, University of Guelph Guelph, ON, N1G 2W1	Phone: 519-824-4120 ext. 3386 Fax: 519-763-8933 cswanton@plant.uoguelph.ca
Curnoe, Bill	U of G	Kemptville College, University of Guelph Kemptville, ON, K0G 1J0	Phone: 613-258-8349 Fax: 613-258-8477 bcurnoe@kemptvillec.uoguelph.ca

Murray Porteous	OFVGA	Kingwood Farms RR 4, Simcoe, ON, N3Y 4K3	Phone: (519) 443-6605 (519) 429-2003 cell Fax: (519) 443-8847 mporteous@kwic.com
John O'Sullivan	U of G	1 Stone Road West 4 th Floor N.W. Guelph, ON, N1G 4Y2	Phone: 519-826-3805 (519) 426-7127 ext. 336 Fax: 519-826-3841 josulliv@uoguelph.ca
Blake Ferguson	CFIA	Canadian Food Inspection Agency London District Office 1299 Commissioners Road East Unit 19 London, ON, N5Z 4R3	Phone: 519-691-1306 ext. 142 Fax: 519-691-1314 fergusonb@em.agr.ca
Sears, Mark	U of G	University of Guelph Dept. of Environmental Biology Guelph, ON, N1G 2W1	Phone: 519-824-4120 Ext. 3921 Fax: 519-837-0442 msears@evbhort.uoguelph.ca
Gilles Saindon	AAFC	Agriculture and Agri-Food Canada Pest Management Research Centre 1392 Sandford Street, London, ON, N5V 4T3	Phone: 519-457-1470 ext. 205 Fax 519-457-3503 saindong@em.agr.ca
Gary Whitfield	AAFC	Agriculture and Agri-Food Canada Greenhouse and Processing Crops Research Centre	Phone: 519-738-2251 ext. 402 Fax: 519-738-3756 whitfieldg@em.agr.ca

Jeff Wilson	ARJO	RR 3 Orton, Ontario, L0N 1N0	
Mary Ruth McDonald	U of G	Department of Environmental Biology	Phone: 519-824-4120 ext. 2791 Fax 519-767-0755 mmcdona@uoguelph.ca

SUB COMMITTEE CHAIRS

Dave Chapeskie Agroforestry	OMAFRA	Ontario Ministry of Agriculture, Food, Rural Affairs Kemptville Resource Centre Concession Road, Box 2004 Kemptville, Ontario K0G 1J0	Phone: 613-258-8302 Fax: 613-258-8392 dave.chapeskie@omafra
Roberts, Graham Apiculture and pollination	OBA	P.O. Box 441 Thornbury, ON N0H 2P0	Phone: 519-599-3063 Fax: 519-599-3063 groberts@bmts.com
Solymar, Bernie Apple	OMAFRA	Ontario Ministry of Agriculture, Food, Rural Affairs Horticultural Research Institute of Ontario Horticultural Experiment Station Box 587, Simcoe, Ontario N3Y 4N5	Phone: 519-426-7120 Fax: 519-428-1142 bsolymar@omafra.gov.on.ca

Hughes, Becky Berry Chair	UofG	New Liskeard Ag. Research Stn New Liskeard, Ontario P0J 1P0	Phone: 705-647-8525 Fax: 705-647-9315 bhughes@onlink.net
Chaput, Jim Crucifer	OMAFRA	1 Stone Rd. W., ARD, 3 rd Floor, Guelph, ON, N1G 4Y2	Phone: 519-826-3539 Fax: 519-826-3567 ichaput@omafra.gov.on.ca
Schooley, Jan Ginseng	OMAFRA	Ontario Ministry of Agriculture, Food, Rural Affairs Field Services, Box 587 Simcoe, Ontario N3Y 4N5	Phone: 519-426-7120 Ext. 317 Fax: 519-428-1142 jschoole@omafra.gov.on.ca
Walker, Gerry Grape and Wine	OMAFRA	4890 Victoria Ave. N. PO Box 7000, Vineland Station, ON L0R 2E0	Phone: 905-562-3833 Fax: 905-562-5933 walker@OMAFRA.gov.on.ca
Papadopoulos, Tom Greenhouse Veg Chair	AAFC	Agriculture and Agri-Food Canada Harrow Research Centre, Highway 18 East Harrow, ON, N0R 1G0	Phone: 519-738-2251 x 423 Fax 519-738-2929 Papadopoulos@em.agr.ca
Rinker, Danny Lee Mushroom Working Group	U of G	HRIO, 4890 Victoria Avenue North, Box 7000 Vineland Station, ON, L0R 2E0	Phone: 905-562-4141 Ext. 132 Fax: 905-562-3413 Drinker@hrrio.uoguelph.ca

Brown, Wayne Greenhouse Floriculture Chair	OMAFRA	Ontario Ministry of Agriculture, Food, Rural Affairs HRIO, 4890 Victoria Avenue North, Box 7000 Vineland Station, ON, L0R 2E0	Phone: 905-562-4141 Ext. 179 Fax: 905-562-3413 Wbrown@omafra.gov.on.ca
Mike Columbus Low acreage and Special crops	OMAFRA	Ontario Ministry of Agriculture, Food and Rural Affairs Simcoe Resource Centre Box 587, Simcoe, ON, N3Y 4N5	Phone: (519)426-4509 Fax: (519) 428-1142 Mcolumbu@omafra.gov.on.ca
Asparagus Working Group			
Hallett, Rebecca Muck crops	U of G	University of Guelph Department of Environmental Biology	Phone: 519-824-4120 x 4488 Fax: 905-775-4546 Rhallett@evbhort.uoguelph.ca
Carey, Ken Nursery, Landscape and Turf	GTI	Guelph Turfgrass Institute 328 Victoria Road S. Guelph, ON., N1H 6H8	Phone: 519-824-4120 Fax: 519-766-1704 Kcarey@uoguelph.ca
Banks, Eugenia Potatoes	OMAFRA	Ontario Ministry of Agriculture, Food, Rural Affairs Mono Plaza, R.R. #4 Orangeville, ON L9W 2Z1	Phone: 519-941-3830 Fax: 705-725-7296 Eugenia.banks@omafra.gov.on.ca

Zandstra, John Sweet Corn	U of G	Ridgetown College, University of Guelph Main Street East Ridgetown, ON, N0P 2C0	Phone: 519-674-1627 Fax: 519-674-1600 jzandstr@ridgetownc.uoguelph.ca
Hunter, David Tender Fruit	AAFC	SCPFRC 4902 Victoria Ave. N. Box 6000 Vineland Station, ON, L0R 2E0	Phone: 905-562-4113 Ext.228 Fax: 905-562-4335 HunTERda@em.agr.ca
Warner, John Tomatoes	AAFC	Agriculture and Agri-Food Canada Greenhouse and Processing Crops Research Centre Harrow, ON, N0R 1G0	Phone: 519-738-2251 Ext.427 Fax: 519-738-2929 Warnerj@em.agr.ca

MEMBERSHIP OF OHCRSC SUBCOMMITTEES

AGROFORESTRY

Chapeskie, Dave	Chair	OMAFRA	Ontario Ministry of Agriculture, Food & Rural Affairs ORC Building, Box 2004 Kemptville, ON, K0G 1J0	Phone: 613-258-8302 Fax: 613-258-8392 dave.chapeskie@omafra.gov.on.ca
Leuty, Todd		OMAFRA	Ontario Ministry of Agriculture, Food & Rural Affairs Bovey Building, University of Guelph Guelph, ON N1G 2W1	Phone: 519-824-4120 Ext. 8957 Fax: 519-837-0442 todd.leuty@omafra.gov.on.ca
Campbell, Doug		SONG	Society of Ontario Nut Growers RR 1 Niagara-on-the-Lake, ON, L0S 1J0	Phone: 905-262-4927
Boysen, Eric		OMNR	Private Land Forestry Policy Advisor Ontario Ministry of Natural Resources 300 Water Street, PO Box 7000 Peterborough, ON, K9J 8M5	Phone: 705-755-5999 Fax: 705-755-1971 eric.boysen@omnr.gov.on.ca

Gardner, John	OMAFRA	Ontario Ministry of Agriculture, Food & Rural Affairs 100 Enterprise Drive, Unit #7 RR 7, Komoka, ON, N0L 1R0	Phone: 519-873-4084 Fax: 519-473-6431 john.gardner@omafra.gov.on.ca
Gordon, Andrew	U of G	University of Guelph Bovey Building, Environmental Biology Guelph, ON, N1G 2W1	Phone: 519-824-4120 Ext. 2415 Fax: 519-837-0442 Ext. 2415 agordon@evbhort.uoguelph.ca
Graham, Andy	OSCIA	Ontario Ministry of Agriculture, Food & Rural Affairs 1 Stone Road Guelph, ON, N1G 2W1	Phone: 519-826-4216 Fax: 519-826-4224 agraham@ontariosoilcrop.org
McGregor, Ken	OMSPA	Ontario Maple Syrup Producers' Association RR 6 Strathroy, ON, N7G 3H7	Phone: 519-232-4596 Fax: 519-232-9166 kenneth.mcgregor@sympatico.ca
Thevathason, Naresh	U of G	University of Guelph Bovey Building, Environmental Biology Guelph, ON, N1G 2W1	Phone: 519-824-4120 Ext. 3488 Fax: 519-837-0442 nthevath@uofguelph.ca
Ross Gough	CTFO	42 Glen Eton Road Wasaga Beach, ON, L0L 2P0	Phone: 705-429-5328 Fax: 705-429-6561 ctfo@christmastrees.on.ca

APICULTURE AND POLLINATION

Roberts, Graham	OBA	PO Box 441 Thornbury, ON, N0H 2P0	Phone: 519-599-3063 Fax: 519-599-3063 groberts@bmts.com
Vander Dussen, David	OBA	Box 142 Stirling, ON, K0K 3E0	Phone: 613-395-5398 Fax: 613-395-4257 riverval@kos.net
McRory, Doug	OMAFRA	1 Stone Road W Guelph, ON, N1G 4Y2	Phone: 519-826-3595 Fax: 519-826-3567 dmcrory@omafra.gov.on.ca
Nasr, Medhat	OBA	OBA c/o Dept. of Environ. Biology University of Guelph Guelph, ON, N1G 2W1	Phone: 519-824-4120 ext 6243 Fax: 519-837-0442 mnasr@evb.uoguelph.ca
Bryans, Davis	OBA	Box 190 Alvinston, ON, N0N 1A0	Phone: 519-898-2843 Fax: 519-898-2021 dbryans@xcelco.on.ca
Davies, Barry	OBA	RR 1 Seeley's Bay, ON, K0H 2N0	Phone: 613-387-3171 Fax: 613-387-3171 davapi@kos.net
Ferguson, Bill	OBA	RR 2 Hensall, ON, N0M 1X0	Phone: 519-236-4979 Fax: 519-236-7048 ferga@hav.net

Gardner, John	OMAFRA	667 Exeter Rd London, ON, N6E 1L3	Phone: 519-873-4084 Fax: 519-873-4062 Jgardner@omafra.gov.on.ca
Hiemstra, Henry	OBA	RR 4 Aylmer, ON, N5H 2R3	Phone: 519-773-5503 Fax: 519-773-5503
Kelly, Paul	EVB, U of G	Dept. of Environ. Biology University of Guelph Guelph, ON, N1G 2W1	Phone: 519-824-4120 ext 3472 Fax: 519-837-0442 pgkelly@evb.uoguelph.ca
Kevan, Peter	EVB, U of G	Dept. of Environ. Biology University of Guelph Guelph, ON, N1G 2W1	Phone: 519-824-4120 ext 2479 Fax: 519-837-0442 pkevan@uoguelph.ca
Macmillan, David	OBA	RR 2 Thornloe, ON, P0J 1S0	Phone: 705-563-8222
Minnick, Bill	OBA	2911 Rd5 Smithville, ON, L0R 2A0	Phone: 905-957-3667
Montoux, Paul	OBA	RR 1 Hagersville, ON, N0A 1H0	Phone: 905-768-5530 Fax: 905-768-4364 mbees@sympatico.ca
Otis, Gard	EVB, U of G	Dept. of Environ. Biology University of Guelph Guelph, ON, N1G 2W1	Phone: 519-824-4120 ext 2478 Fax: 519-837-0442 gotis@evb.uoguelph.ca
Szabo, Tibor	OBA	RR 1 Puslinch, ON, N0B 2J0	Phone: 519-763-2715

Westlake, Pat	OBA	RR 1 Bayfield, ON, N0M 1G0	Phone: 519-565-2622 Fax: 519-565-5452 ontbee@tcc.on.ca
<u>APPLE</u>			
Appleby, Margaret	Ontario Ministry of Agriculture, Food and Rural Affairs	95 Dundas St., RR 3, Brighton, ON, K0K 1H0	Phone: 613-475-5850 Fax: 613-475-3835 mapleby@omafra.gov.on.ca
Chu, George	University of Guelph	Box 7000, 4890 Victoria Ave., Vineland Station, ON, L0R 2E0	Phone: 905-562-4141 Fax: 905-562-3413 gchu@uoguelph.ca
Cline, John	University of Guelph	Dept. Plant Agriculture, Univ. of Guelph, Box 587, Simcoe, ON, N3Y 4N5	Phone: 519-426-7127 Fax: 519-426-1225 icline@uoguelph.ca
Ferguson, Blake	Canadian Food Inspection Branch	457 Ridgewand St., Room 404, London, ON, N6A 3E3	Phone: 519-6545-5816 fergusonb@em.agr.ca
Frankis, Paul	Apple Growers of Ontario	832 Rd. 2 E., Kingsville, ON, N9Y 2E4	Phone: 519-733-8200 Fax: 519-733-2788 pfrankis@mnsi.net
Gilroy, Brian	Ontario Fruit and Vegetable Growers Association	R.R.#2, Meaford, ON, N4L 1W6	Phone: 519-538-2782 Fax: 519-538-4835 nighthawkorch@bmts.com

Henderson, John	Ontario Ministry of Agriculture, Food and Rural Affairs	Food Inspection Branch, 95 Dundas St., RR 3, Brighton, ON, K0K 1H0	Phone: 613-475-1630 Fax: 613-475-3835 jhenderson@omafra.gov.on.ca
Hunter, David	Agriculture and Agri-Food Canada	SCPFRC, 4902 Victoria Ave. N., Box 6000, Vineland Station, ON, L0R 2E0	Phone: 905-562-4113 Fax: 905-562-4335 hunterd@em.agr.ca
Luffman, Margie	Agriculture and Agri-Food Canada	2585 County Rd. 20, Harrow, ON, N0R 1G0	Phone: 519-738-2251, ext. 474 Fax: 519-738-2829 luffmanm@em.agr.ca
MacKenzie, Ian	Apple Growers of Ontario	7195B Millcreek Dr., Mississauga, ON, L5N 3R3	Phone: 905-858-1060 Fax: 905-858-3299 oamc@ontarioapples.com
Montoux, Paul	Ontario Beekeeper's Association	RR 1, Hagersville, ON, N0A 1H0	Phone: 905-768-5530 mbees@sympatico.ca
Moyer, Arthur	Apple Growers of Ontario	114 Ridge Rd. E., Grimsby, ON, L3M 4E7	Phone: 905-945-2408 moyera@interlynx.net
Murr, Dennis	University of Guelph	Dept. of Plant Sciences, Guelph, ON, N1G 2W1	Phone: 519-824-4120x3578 Fax: 519-767-0755 dmurr@uoguelph.ca
Schooley, Harold	Apple Growers of Ontario	RR 1, Windham Centre, ON, N0E 2A0	Phone: 519-426-1841 Fax: 519-426-6357 schooley@kwick.com

Solymar, Bernie	Ontario Ministry of Agriculture, Food and Rural Affairs	Box 587, Simcoe, ON, N3Y 4N5	Phone: 519-426-4322 Fax: 519-4281142 bsolymar@omafra.gov.on.ca
Trimble, Mitch	Agriculture and Agri-Food Canada	SCPERC, 4902 Victoria Ave., N., Box 6000, Vineland Station, ON, L0R 2E0	Phone: 905-562-4113 Fax: 905-562-4335 trimbler@em.agr.ca
VanDiepen, John	Ontario Nursery Trades Association	Warwick Orchards & Nursery, RR8, Watford, ON, N0M 2S0	Phone: 519-849-6730 Fax: 519-849-6731 warwick@xcelco.on.ca
Welstead, Ron	Apple Growers of Ontario	RR 2, Clarksburg, ON, N0H 1J0	Phone: 519-599-3012 rkb.welstead@bmts.com
Wilson, Ken	Ontario Ministry of Agriculture, Food and Rural Affairs	Box 658, Thornbury, ON, N0H 1J0	Phone: 519-599-2042 Fax: 519-599-5700 kwilson@omafra.gov.on.ca
Zandstra, John	University of Guelph	RCAT, Main St. E., Ridgetown, ON, N0P 2C0	Phone: 519-674-1627 Fax: 519-674-1600 izandstr@ridgetownc.uoguelph.ca
<u>BERRY CROPS</u>			
Hughes, Becky Chairperson: (1999-2001)	New Liskeard Agricultural Research Station	University of Guelph, New Liskeard, ON, P0J 1P0	Phone: 705-647-8525 ext 222 Fax: 705-647-9315 bhughes@onlink.net

Sullivan, Alan Vice-Chairperson: (2001)	Dept. of Plant Agriculture	University of Guelph, Guelph ON, N1G 2W1	Phone: 519-824-4120 ext 2792. Fax: 519-767-0755 asullivan@evbhort.uoguelph.ca
Appleby, Margaret IPM Specialist	OMAFRA	RR # 3 Box 8200, Dundas St, Brighton, ON, K0K 1H0	Phone: 613-475-5850 Fax: 613-475-3835 mapleby@omafra.gov.on.ca
Charbonneau, Norm	Ontario Berry Growers Association	RR 2, Port Elgin, ON, N0H 2C6	Phone: 519-832-5283
Chesney, Rob	Ontario Berry Growers Association	RR 2, Innerkip, ON, N0J 1M0	Phone: 519-469-3636 Fax: 519-469-3266
Chu, George		Dept. of Plant Agriculture, University of Guelph, Box 7000, Vineland Station, ON L0R 2T0	Phone: 905-562-4141 ext 118 Fax: 905-562-3413 gchu@uoguelph.ca
Cooper, John Chair Research Committee,	Ontario Berry Growers Association	Strawberry Tyme Farms, RR 2, Simcoe, ON, N3Y 4K1	Phone: 519-426-3099 Fax: 519-426-2573 styme@kwic.com
Dale, Adam		Dept. of Plant Agriculture, University of Guelph, Box 587 Simcoe, ON, N3Y 4N5	Phone: 519-426-7120 Fax: 519-426-1225 adale@uoguelph.ca
Fielden, Joan	Ontario Berry Grower's Association	c/o Talisman Farms, RR 4 Uxbridge, ON, L4P 1R4	Phone: 905-649-2101 Fax: 905-649-2102 ontberries@interhop.net

Fisher, Pam	Berry Crop Specialist, OMAFRA	Box 587 Simcoe, ON, N3Y 4N5	
Heeman, Rudy	Grower	RR 2, Thorndale, ON, N0M 2P0	Phone: 519-461-0181 Fax: 519-461-0181 fragaria@eagle.ca
Hughes, Peter	Grower,	RR 4, Colborne, ON, K0K 1S0	Phone: 905-355-2499 Fax: 905-355-2496 fragaria@eagle.ca
Johnston, Murray	Ontario Cranberry Grower's Association	1074 Cranberry Road, PO Box 24, Bala, ON, P0C 1A0	Phone: 705-762-3203 Fax: 705-762-3213 cranberry@muskoka.com
Klassen, Ted	Ontario Highbush Blueberry Growers	RR 1, Harrow ON, N0R 1G0	Phone 519-738-6086
Nassuth, Annette		Dept. of Botany, University of Guelph, Guelph, ON, N1G 2W1	Phone: 519-824-4120 ext. 8787 Fax: 519-767-1991 anassuth@uoguelph.ca
Potter, John	Agriculture & Agri-Food Canada	Box 6000, Vineland Station, ON, L0R 2E0	Phone: 905-562-4113 Fax: 905-562-4335 potterj@em.agr.ca
Schumacher, Bengt Regional Quality Coordinator,	OMAFRA	2284 Nursery Rd, Midhurst, ON, L0L 1X0	Phone: 705-725-7290 Fax: 705-725-7296 bschumac@omafra.gov.on.ca
Uyenaka, Joe	Cargill Ltd.	Box 209, Alliston, ON, L9R 1V5	Phone: 905-979-0737 Fax: 905-387-9110

Whittamore, Mike	Ontario Berry Growers Association	Whittamore Berry Farm, 7100-11th Line, Markham, ON, L6B 1A8	Phone: 905-471-4511 Fax: 905-472-4511 whitbro@IBM.net
Zandstra, John	Ridgetown College,	University of Guelph, Ridgetown, ON, N0P 2C0	Phone: 519-674-1627 Fax: 519-674-1600 jzandstr@ridgetownc.uoguelph.ca

CRUCIFER CROPS

Chaput, Jim Chair	OMAFRA	1 Stone Rd. W., ARD, Guelph, ON, N1G 4Y2	Phone: 519-826-3539 Fax: 519-826-3567 jim.chaput@omafra.gov.on.ca
Collins, Ken	GROWER	RR 1, Troy, ON, L0R 2B0	Phone: 905-628-1425, Fax: 905-628-1426 collinsj@interlynx.net
Demeulenaere, Archie	GROWER	R. R. # 5, Waterford, ON, N0E 1Y0	Phone: 519-443-5816
Hallett, Rebecca	U. of G.	Dept. of Env. Biology, U. of G., Guelph, ON, N1G 2W1	Phone: 519-824-4120 ext. 4488, Fax: 519-837-4220 rhallett@evb.uoguelph.ca
Hogervorst, Tony	GROWER	R. R. # 8, Watford, ON, N0M 2S0	Phone: 519-849-6573
McKeown, Alan	U. of G.	Simcoe Research Stn., Box 587, Simcoe, ON, N3Y 4N5	Phone: 519-426-7127 ext. 329 Fax: 519-426-1225 amckeown@uoguelph.ca

Neil, Jim	GROWER	Quality Produce Ltd., R. R. # 1, Exeter, ON, N0M 1S4	Phone: 519-235-1921 Fax: 519-235-1927
O'Sullivan, John	U. of G.	Simcoe Research Stn., Box 587, Simcoe, ON, N3Y 4N5	Phone: 519-426-7127 ext. 336 Fax: 519-426-1225 josulliv@uoguelph.ca
Procyk Farms	GROWER	R. R. # 1, Wilsonville, ON, N0E 1Z0	Phone: 519-443-4516 Fax: 519-4434511
Scott-Dupree, Cythnia	U. of G.	Dept. of Env. Biology, U. of G., Guelph, ON, N1G 2W1	As R. Hallett above excpet extension is 2477 csdupree@evb.uoguelph.ca
Shabatura Farms	GROWER	R. R. # 1, Waterford, ON, N0E 1Y0	Phone: 519-443-7608 or 5919, Fax: 519-443-4643 Shab@kwic.com
Tolman, Jeff	AAFC	London Res. Center, 1391 Sanford St., London, ON, N5V 4T3	Phone: 519-457-1470 ext. 232, Fax: 519-457-3997 tolmanj@em.agr.ca
Tregunno, Brian	INDUSTRY	Bejo/Seedway, 259 Camelot Dr., Burlington, ON, L7L 2E9	Phone: 905-637-7926 Fax: 905-637-7578 bbtregun@cgocable.net
Uyenaka, Joe	INDUSTRY	Cargill Ag. Horizons, Box 209, Alliston, ON, L9R 1V5	Phone: 905-979-0737 cell Fax: 905-387-9110
Vissscher, Bert	GROWER	R. R. # 1, Hay, ON, N0M 1W0	Phone: 519-237-3442 Fax: 519-237-3856 vissscher@hay.net

Quebec Research
representative

AAFC

430 Boul. Gouin, CP 457, St.
Jean sur Richelieu, Quebec,
J3B 6Z8

demarsd@em.agr.ca

GINSENG

Ken Spreit

President GGAC

John VanEs

GGAC Director

Gerry Banfield

Chi Na Ta, grower

Theresa Smith

Scotland Agromart

Don MacMillan

Norfolk Co-op

Stuart Budd

OMAFRA

Rick Reeleder

AAFC

Bob Roy

AAFC

Jan Schooley

Chair

GREENHOUSE AND PROTECTED CROPS

Dr.A.P. Papadopoulos
Chairperson

Ms. G. Ferguson
Vice-Chairperson

GREENHOUSE VEGETABLE WORKING GROUP

Mr. Paul Brine

OMAFRA-Analyst

OMAFRA-ERLD
1 Stone Rd. W.
Guelph, ON, N1G 4Y2

Phone: (519) 826-4162
Fax: (519) 826-4211
pbrine@omafra.gov.on.ca

Mr. M. Celetti

OMAFRA

OMAFRA
Edmund C. Bovey Bldg
Univ. of Guelph
Guelph, ON, N1G 2W1

Phone: 519-824-4120, ext. 8910
Fax: 519-767-0755
mceletti@omafra.gov.on.ca

Dr. Ray Cerkaskas

AAFC-Plant Pathology

Agriculture & Agri-Food
Canada
Greenhouse & Processing
Crops Res. Centre
Harrow, ON, N0R 1G0

Phone: 519-738-2251, ext. 424
Fax: 519-738-2929
cerkauskr@em.agr.ca

Mr. Kelly Devaere

Industry

MGS Horticultural Inc.
50 Hazelton St. (P.O. Box #33)
Leamington, ON, N8H 3W1

Phone: 519-326-9032
Fax: 519-326-5861
Cell: 519-322-9864
kellymg@mnsi.net

Mr. Matt Dick

Cucumber growers

RR # 2
Ruthven, ON, N0P 2G0

Phone: 519-326-2004; Pgr. 259-
1779
Fax: 519-326-2004

Dr. Bernie Grodzinski

Univ. of Guelph

University of Guelph
Dept. of Hort. Science
Guelph, ON, N1G 2W1

Cell: 519-791-1368
Phone: 519-824-4120 Ext. 3439
Fax: 519-767-0755
bgrodzinski@evbhort.uoguelph.ca

Ms. Gillian Ferguson

OMAFRA

OMAFRA
c/o Agriculture & Agri-Food
Canada
Greenhouse & Processing
Crops Res. Centre
Harrow, ON, N0R 1G0

Phone: 519-738-2251, ext. 406
Fax: 519-738-2929
gfergusl@omafra.gov.on.ca

Mr. Peter Haakman	Cucumber growers	Haakman Greenhouses 770 Foss Rd., RR 1 Fenwick, ON, L0S 1C0	Phone: 905-892-2352 home 892-4253 Fax: 905-892-2989
Ms. Jennifer Hale	Industry	Plant Products Co. Ltd. 314 Orenda Rd. Brampton, ON, L6T 1G1	Phone: 905-793-7000 Fax: 905-793-9632 hale@plantprod.com
Mr. Tom Jewett	AAFC-Engineering	Agriculture & Agri-Food Canada Greenhouse & Processing Crops Res. Centre Harrow, ON, N0R 1G0	Phone: 519-738-2251, ext. 422 Fax: 519-738-2929 jewettt@em.agr.ca
Mr. Denton Hoffman	OGVPMB	OGVPMB 139 Oak St. W. Learnington, ON, N8H 2B8	Phone: 800-265-6926 Fax: 519-326-7842 denton@ontariogreenhouse.com
Mr. C. Kessel	OMAFRA-Extension	OMAFRA 1 Stone Rd. Guelph, ON, N1G 4Y2	Phone: 519-824-4120 Ext. 2480 ckessel@omafra.gov.on.ca
Mr. Shalin Khosla	OMAFRA-Extension	OMAFRA c/o Agriculture & Agri-Food Canada Greenhouse & Processing Crops Res. Centre Harrow, ON, N0R 1G0	Phone: 519-738-2251, ext. 405 Fax: 519-738-2929 Cell: 519-734-7786 skhosla@omafra.gov.on.ca
Mr. Gerry Mastronardi	Tomato growers	T.G.&G. Farms 2071 Cardinal Lane Kingsville, ON, N9Y 2X3	Phone: 519-322-2769 Fax: 519-322-4736

Mr. Doug Marlow	Industry	Grodan 425 Industrial Dr. Milton, ON, L9T 5A6	Phone: 905-875-4024 Fax: 905-875-1216
Mr. Angelo Mastronardi	Tomato growers	RR 2 Ruthven, ON, N0P 2G0	Phone: 519-326-1189 Fax: 519-326-6242
Dr. Tom Papadopoulos	AAFC-Plant Physiology	Agriculture & Agri-Food Canada Greenhouse & Processing Crops Res. Centre Harrow, ON, N0R 1G0	Phone: 519-738-2251, ext. 423 Fax: 519-738-2929 papadopoulos@em.agr.ca
Dr. Les Shipp	AAFC-Entomology	Agriculture & Agri-Food Canada Greenhouse & Processing Crops Res. Centre Harrow, ON, N0R 1G0	Phone: 519-738-2251, ext. 431 Fax: 519-738-2929 shipp@em.agr.ca
Dr. Ron Pitblado	OHCRSC	University of Guelph Ridgetown College - Agronomy Bldg Ridgetown, ON, N0P 2C0 Canadian HydroGardens, Straver & Assoc. 1386 Sandhill Dr. Ancaster, ON, L9G 4V5	Phone: 519-674-1605 Fax: 519-674-1600 rpitblad@ridgetownc.uoguelph.ca
Mr. Bill Straver	Industry		Phone: 905-934-4193; 905-648-1801 Fax: 905-934-4809; 905-648-1870 bill.straver1@sympatico.ca
Mr. Willie Tiessen	Tomato and pepper growers	Pyramid Farms 209 Erie St., N. Leamington, ON, N9H 3A5	Phone: 519-326-4989 Fax: 519-326-3027

Mr. Ron Voorberg	Cucumber growers	Foothill Greenhouses Ltd. RR 1 Kettleby, ON, L0G 1J0	Phone: 905-775-2154 Fax: 905-775-0011
Mr. Ron Voorberg	Cucumber growers	Foothill Greenhouses Ltd. RR 1 Kettleby, ON, L0G 1J0	Phone: 905-775-2154 Fax: 905-775-0011
Mr. Craig Hunter Representing:	OPMRSC	OMAFRA - ERLD 1 Stone Rd. W. Guelph, Ontario, N1G 4Y2	Phone: 519-826-4189 chunter@omafra.gov.on.ca

MUSHROOM WORKING GROUP

Chairperson: Dr. D. L. Rinker

COMMERCIAL MUSHROOMS SUB-GROUP

Chairperson: Danny Lee Rinker

University of Guelph Horticultural Research Institute of Ontario 4890 Victoria Ave, Box 7000 Vineland, ON L0R 2E0	Phone: 905-562-4141 #132 Fax: 905-562-3413 Email: DRinker@UoGuelph.Ca
Whitecrest Mushrooms Limited R.R. #1 Putnam, ON N0L 2B0	Phone: 519-269-3534 Fax: 519-269-3202

Hank Hermans

Battista Piccioni

Tel/Fax: 905-628-3090

Piccioni Brothers Mushroom
Farm
355 Rock Chapel Rd.
R.R. #2
Dundas, ON L9H 5E2

Alan Castle

Phone: 905-688-5550 #3598
Fax: 905-688-1855

Brock University
500 Glenridge
St. Catharines, ON L2S 3A1

M.A. Snobelen

Phone: 905-655-3373
Fax: 905-655-8435

Greenwood Mushroom Farm
9760 Heron Rd
Ashburn, ON L0B 1A0

Ron Pitblado

Phone: 519-674-1605
Fax: 519-674-1600

University of Guelph
Ridgetown College
Ridgetown, ON N0P 2C0

Lyle Whitham

Phone: 613-821-1441
Fax: 613-821-1770

Continental Mushroom
P.O. Box 250
Metcalfe, ON K0A 2P0

Murray O'Neil

Phone: 519-326-8643
Fax: 519-326-7222

Highline Produce Limited
R.R. #3
Leamington, ON N8H 3V6

Hank VanderPol

Phone: 519-676-8125
Fax: 519-676-4956

Rol-land Farms
R.R.#4
Blenheim, ON N0P 1A0

Tim Adlington

Leaver Mushroom Farm
P.O. Box 190
7399 Guelph Line
Campbellville, ON L0P 1B0

Phone:905-878-9375
Fax:905-878-5045

SPECIALTY MUSHROOMS SUB-GROUP

Chairperson: Dr. D. L. Rinker

Bill Wylie

Wylie Mycologicals
R.R. # 1
Warton , ON N0H 2T0

Phone:519-534-1570
Fax:519-534-9045

Hua Meng

Nordik Mushrooms
729 Champlain Drive
Cornwall, ON K6H 6P4

Phone:613-932-9977

David Anderson

Andy's Caps
R R 1
Walsingham, Ontario N0E 1X0

Phone:519-586-2644

Bruno Pretto

Fun Guy Farm
R R #1
Goodwood, ON L0C 1A0

Phone:416-963-5520

Battista Piccioni

355 Rock Chapel Rd
RR 2
Dundas, ON L9H 5E2

GREENHOUSE FLORICULTURE

Wayne Brown
Chair

OMAFRA

Ontario Ministry of
Agriculture, Food and Rural
Affairs
HRIO, University of Guelph
4890 Victoria Avenue North
Box 7000
Vineland Station, ON, L0R
2E0

Phone: 905-562-4141 ext. 179
Fax: 905-562-3413

Graeme Murphy
Vice Chair

OMAFRA

Ontario Ministry of
Agriculture, Food and Rural
Affairs
HRIO, University of Guelph
4890 Victoria Avenue North
Box 7000
Vineland Station, ON, L0R
2E0

Phone: 905-562-4141 ext. 106
Fax: 905-562-3413

John Albers

Industry

Can-Gro Greenhouses Niagara
Ltd.
RR 1, First Avenue
Vineland Station, ON, L0R
2E0

Phone: 905-562-4395
Fax: 905-562-4393

Wayne Allen

AAFC

Agriculture and Agri-Food
Canada
4902 Victoria Avenue North,
Box 6000
Vineland Station, ON, L0R 2E0

Phone: 905-562-4113
Fax: 905-562-4335

Theo Blom	U of G	Department of Plant Agriculture HRIO, University of Guelph 4890 Victoria Avenue North Box 7000 Vineland Station, ON, L0R 2E0	Phone: 905-562-4141 ext 160 Fax: 905-562-3413
Terry Colasanti	Industry	Colasanti Farms Ltd. PO Box 40 Ruthven, ON, N0P 2G0	Phone: 519-326-3287 Fax: 519-322-2302
Mike Dixon	U of G	Department of Plant Agriculture Bovey Building University of Guelph Guelph, ON, N1G 2W1	Phone: 519-824-4120 Fax: 519-767-0755
Bernie Grodinski	U of G	Department of Plant Agriculture Bovey Building University of Guelph Guelph, ON, N1G 2W1	Phone: 519-824-4120 Fax: 519-767-0755
Jenny Hale	Industry	Plant Products Co. Ltd. 314 orenda Road Brampton, ON, L6T 1G1	Phone: 905-793-7000 Fax: 905-793-9157
Wayne Houtby	Industry	Penglad Farms RR 3 St. Catharines, ON, L2R 6P9	Phone: 905-684-7861 Fax: 905-682-9769

Jim Jeffery	Industry	Jeffery's Greenhouse RR 3, Lakeshore Road West St. Catharines, ON, L2R 6P9	Phone: 905-934-0514 Fax: 905-934-9044
Ted Oorsprong	Industry	Northend Gardens 4030 15 th Street Jordan Station, ON, L0R 1S0	Phone: 905-562-3563 Fax: 905-562-3717
Leo Reus	Industry	Balfour Greenhouses 1396 Balfour Street Fenwick, ON, L0S 1C0	Phone: 905-892-5744 Fax: 905-892-3817
Mel Sawaya	Industry	Focus Greenhouse Management Inc. RR 5 Simcoe, ON, N3Y 4K4	Phone: 519-428-1716 Fax: 519-428-1810
Ed Sobkowich Jr.	Industry	Sobkowich Greenhouses Ltd. 398 Maple Avenue Grimsby, ON, L3M 3B9	Phone: 905-945-8870 Fax: 905-945-1499
Irwin Smith	Industry	Flowers Canada Ontario Box 1114 Guelph, ON, N1H 6N3	Phone: 519-836-5495 Fax: 519-836-7529
Mark Thiessen	Industry	Thiessen Greenhouse Flowers Ltd. RR 3 Leamington, ON, N8H 3V6	Phone: 519-326-5282 Fax: 519-326-2089

John Valk	Industry	Valk Greenhouses Ltd. 280 Main Street West Grimsby, ON, L3M 1S4	Phone: 905-945-2889 Fax: 905-945-4195
Neil Van Geest	Industry	Kerman Avenue Greenhouses 378 South Service Road East Grimsby, ON, L3M 5A5	Phone: 905-945-2681
Gerald VanderLugt	Industry	Richmond Greenhouses 11211 Bayview Avenue, Box 327 Richmond Hill, ON, L4C 4Y6	Phone: 905-884-8175 Fax: 905-884-9032
Chuck Vermeer	Industry	Westbrook Greenhouses PO Box 99 Grimsby, ON, L3M 4G1	Phone: 905-945-9611 Fax: 905-563-8701
<u>LOW ACREAGE AND SPECIAL CROPS</u>			
Blydorp, Leo	Industry	RR7 Orangeville, L9W 2Z3	Phone: 519-942-0730 <u>Leoblydorb.b@bayer.com</u>
Brine, Paul	OMAFRA	1 Stone Road., 4 th Floor Guelph, N1G 4Y2	Phone: 519-826-4162 Fax: 519-826-4211 <u>Pbrine@omafra.gov.on.ca</u>
Cerkauskas, Ray	AAFC	2585 Hwy. 18E, Harrow, N0R 1G0	Phone: 519-738-2251 ext. 424 Fax: 519-738-2929 <u>Cerkauskasr@em.agr.ca</u>

Chaput, Jim	OMAFRA	RR1 Kettleby, L0G 1J0	Phone: 905-775-4261 Fax: 905-775-4546 Jchaput@omafra.gov.on.ca
Chechak, Kristine	Industry	39 James St., Box 10 St. Catharines, L2R 6R6	Phone: 905-688-4300 Fax: 905-684-8411
Collins, Ken	Grower	RR1, 1402 Hwy. 5 W, Troy, L0R 2B0	905-628-1425 Fax: 905-628-1426 Email: Collinsj@interlynx.net
Columbus, Mike	OMAFRA	Box 587, Simcoe N3Y 4N5	Phone: 519-426-4509 Fax: 519-428-1142 Mcolumnbus@omafra.gov.on.ca
DenBoer, John	Grower	RR 1, Otterville N0J 1R0	Phone: 519-879-6605
Dick, Jim	Industry	Box 700 Dresden, N0P 1M0	Phone: 519-683-4422 Fax: 519-683-2195
Garton, Ron	Industry	2770 Effingham Rd., R1 St. Catherines L2R 6P7	Phone: 905-682-8101 Fax: 905-682-8832 Ron.garton@seminas.com
Huffman, Leslie	OMAFRA	2583, Hwy 18E Harrow N0R 1G0	Phone: 519-738-2251 Fax: 519-776-8028 lhuffman@omafra.gov.on.ca

Hunter, Craig	OFVGA	OFVGA, 355 Elmira Rd.N. Unit 105 Guelph N1K 1F5	Phone: 519-763-6160 Fax: 519-763-6160 research@ofvga.org
Hughes, Becky	University of Guelph	New Liskeard College of Arg. Res., New Liskeard P0J 1P0	Phone: 1-800-461-6132 Fax: 705-647-7993
McDonald, Mary Ruth	University of Guelph,	Muck Research Sta. R1 125 Woodchopper Lane Kettleby, L0G 1J0	Phone: 905-775-3783
McKeown, Alan	University of Guelph	HRIO, Box 587, Simcoe N3Y 4N5	Phone: 519-426-7127 ext. 329 Fax: 519-426-1225 Amckeown@uofguelph.ca
O'Sullivan, John	University of Guelph	HRIO, Box 587, Simcoe N3Y 4N5	Phone: 519-426-712 ext. 336 Fax: 519-426-1225 Josullivan@uoguelph.ca
Pape, George	Industry	RR 3, Vanessa, N0E 1V0	Phone: 519-443-8575 Fax: 519-443-4942 Pape@oxford.net
Pieters, Cindy	Industry	RR 1, LaSalette, N0E 1H0	Phone: 519-582-2791 Fax: 519-582-1075 Pieters@kwic.com
Roy, Rob	AAFC	AAFC, Delhi Research Sta. Box 186, Delhi, N4B 2W9	Phone: 519-582-1950 Fax: 519-582-4223 Royr@em.agr.ca

Smith, Pete	Industry	36 Denis Court, Tillsonburg, N4G 2P3	Phone: 519-688-2695 Fax: 519-668-6896
Zandstra, John	University of Guelph RCAT, OMAFRA	Main St. E., Ridgetown N0P 2C0	Phone: 519-674-1603 Fax: 519-674-1600 jzandstr@ridgetownc.uoguelph.on
Temmer, Tony	Growers	Box 184, St. Williams N0E 1P0	Phone: 519-586-7429 Fax: 519-586-2451
Tomecek, Ed	OMAFRA	Box 400 Ridgetown N0P 2C0	Phone: 519-647-1616 Fax: 519-674-1564 Etomecek@omafra.gov.on.ca
Uyenaka, Joe	Industry	1413 Upper Gage Ave. Hamilton L8W 1E6	Phone: 905-929-0737 Fax: 905-387-7031 905-387-9110
Warner, John	AAFC	Harrow Research Station Harrow N0R 1G0	
Chesney, Rob	Grower	RR2, Innerkip, N0J 1M0	Phone: 519-469-3636 Fax: 519-469-3266

MUCK CROPS

Rebecca H. Hallett OMCRSC Chair	University of Guelph	Dept of Environmental Biology, University of Guelph, Guelph, ON N1G 2W1	(519) 824-4120 ext. 4488 (519) 837-0442 (fax) rhallett@evb.uoguelph.ca
------------------------------------	----------------------	---	--

Odile Carisse /Gaetan Bourgeois	AAFC-HRDC	AAFC - HRDC, 430 Boul. Gouin, CP 457, St Jean-sur-Richelieu, PQ, J3B 6Z8	carisseo@em.agr.ca bourgeois@em.agr.ca
Jim Chaput	OMAFRA	OMAFRA, 1 Stone Road, 3 rd floor, Guelph, ON N1G 4Y2	(519) 826-3539 (519) 8263567 (fax) jchaput@omafra.gov.on.ca
Tony Gaetano	Industry	RR# 4, 1295 Canal Rd., Bradford, ON	(905) 775-4407 (905) 715-9386 L.Gaetano@aolcanada
Shawn Janse	Industry	Muck Crops Research Station, RR #1, 1125 Woodchoppers Lane. Kettleby, ON, L0G 1J0	(905) 775-3783 sjanse@uoguelph.ca
Christoph Kessel OMAFRA	OMAFRA	Dept of Land Resource Science, University of Guelph, Guelph, ON, N1G 2W1	(519) 824-4120 ext. 2480 (519) 824-5730 (fax) ckessel@omafra.gov.on.ca
Perry Martos	University of Guelph	Laboratory Service Division - Regulatory, University of Guelph, 95 Stone Rd West, Guelph, ON, N1H 8J7	(519) 767-6209 pmartos@lsd.uoguelph.ca

Mary Ruth McDonald	University of Guelph	Dept of Plant Agriculture University of Guelph, Guelph, ON N1G 2W1	(519) 824-4120 ext. 2791 mrmcdona@uoguelph.ca
Tony Moro,	B&DVGA, President	RR 4, Bradford, ON, L3Z 2A6	
Cynthia Scott-Dupree	University of Guelph	Dept of Environmental Biology, University of Guelph, Guelph, ON N1G 2W1	(519) 824-4120 ext. 2477 (519) 837-0442 (fax) csdupree@evb.uoguelph.ca
Teri Seymour	B&DVGA, Executive Secretary	Box 1691, Bradford, ON, L3Z 2B9	
John Smits	Thedford-Grand Bend	9752 Klondyke Rd, RR#2, Grand Bend, ON, N0M 1T0	(519) 238-8222 (519) 238-2018 (fax) jirsmits@hay.net
Mark Srokosz	OF&VGA, Thedford Veg Growers	9928 Walker Rd., RR#2 Grand Bend, ON, N0M 1T0	(519) 243-2489 (519) 243-3542 (fax) srokoszm@htl.net
Jeff Tolman		AAFC, London, 1391 Sanford St., London, ON N5V 4T3	(519) 457-1470 ext. 232 tolmanj@em.agr.ca

Matthew Valk,

Bejo Seedway

RR#4, Coldwater, ON
L0K 1E0

(705) 835-3777
(705) 835-6898 (fax)
mvalk@simcoe.net

Gerrard Van Alebeek

Ontario Produce Co. Ltd.,
PO Box 550, Bradford, ON
L3Z 2B1

John Vanderburgt
Thedford-Grand Bend

Blue Water Crop Care, RR #1,
Dashwood, ON N0M 1N0

(519) 236-4025
(519) 236-4283
shnji@hotmail.com

Brian Visser,
Chairman, BDPMB

RR#1, Kettleby, ON
L0G 1J0

(905) 775-0959 (H)
(905) 775-5868 (W)

John Zutt

Lakefront Produce,
18 Merritt Parkway, Pt.
Colborne L3K 3Y1

NURSERY, LANDSCAPE AND TURF

Chair Dr. Ken Carey		Guelph Turfgrass Institute 328 Victoria Road S. Guelph, Ontario N1H 6H8	Phone 519-824-4120 x 2777 Fax 519-766-1704 kcarey@uoguelph.ca
Vice-Chair Mr. Tom Somerville		Landscape Ontario Horticultural Trades Assoc. 7856 Fifth Line South, R.R.#4 Station Main Milton, Ontario L9T 2X8	Phone (905) 875-1805 x351 Fax (905) 875-3942 tsomerville@landscapeontario.com
Institutional Research and Service Members Dr. John Potter	AAFC	Agriculture & Agri-Food Canada Box 6000 Vineland Station, Ontario L0R 2E0	Phone 905-562-4113 Fax 905-562-4335 potterj@em.agr.ca
Mr. Rob Witherspoon	GTI	Guelph Turfgrass Institute 328 Victoria Road S. Guelph, Ontario N1H 6H8	Phone 519-824-4120 Fax 519-766-1704 rob@gti.uoguelph.ca
Dr. Calvin Chong	HRIO - U OF GUELPH	HRIO Box 7000 Vineland Station, Ontario L0R 2E0	Phone 905-562-4141 Fax 905-562-3413 cchong@hrio.uoguelph.ca
Mr. Peter Johnston-Berresford	KEMPTVILLE - U OF GUELPH	Kemptville College Box 2003 Kemptville, Ontario K0G 1J0	Phone 613-258-8456 Fax 613-258-8384 pjohnsto@kemptvillecc.uoguelph.ca

Mr. Ken Nentwig	RIDGETOWN - U OF GUELPH	Ridgetown College Ridgetown, Ontario N0P 2C0	Phone 519-674-1628 Fax 519-674-1600 knentwig@ridgetownc.uoguelph.ca
Dr. Ron Pitblado	RIDGETOWN - U OF GUELPH	Ridgetown College Hort. and Pest Management Ridgetown, Ontario N0P 2C0	Phone 519-674-1605 Fax 519-674-1600 rpitblad@ridgetownc.uoguelph.ca
Ms. Annette Anderson	OMAFRA	Crop Technology, OMAFRA Box 1030 Guelph, Ontario N1H 6N1	Phone 519-767-3190 Fax 519-826-4349 aanderso@omafra.gov.on.ca
Ms. Pam Charbonneau	OMAFRA	Guelph Turfgrass Institute 328 Victoria Road S. Guelph, Ontario N1H 6H8	Phone 519-824-4120 x2597 Fax 519-766-1704 pcharbon@omafra.gov.on.ca
Ms. Jennifer Llewellyn	OMAFRA	3108 Edmund C. Bovey Administration Bldg. University of Guelph Guelph, Ontario N1G 2W1	Phone 519-824-4120 x2671 Fax 519-767-0755 jhobson@omafra.gov.on.ca
Dr. Chris Hall	U of G	Environmental Biology Dept. University of Guelph Guelph, Ontario N1G 2W1	Phone 519-824-4120 Fax 519-837-0442 jchall@evbhort.uoguelph.ca
Dr. Tom Hsiang	U of G	Environmental Biology Dept. University of Guelph Guelph, Ontario N1G 2W1	Phone 519-824-4120 Fax 519-837-0442 thsiang@evbhort.uoguelph.ca
Dr. Glen Lumis	U of G	Dept. of Hort. Science University of Guelph Guelph, Ontario N1G 2W1	Phone 519-824-4120 Fax 519-767-0755 glumis@evbhort.uoguelph.ca

Dr. Mark Sears	U of G	Environmental Biology Dept. University of Guelph Guelph, Ontario N1G 2W1	Phone 519-824-4120 Fax 519-837-0442 msears@evbhort.uoguelph.ca
Industry Representatives:	Landscape Ontario	7856 Fifth Line South RR #4, Stn Main Milton, Ontario L9T 2X8	Phone 905-875-1805 Fax 905-875-0183 tonydigiovanni@hort-trades.com
LO Executive Director Mr. Tony DiGiovanni			
Mr. Paul Pilley PGP Pest Mgmt. Consult.	LO - Lawn Care	Box 1021 Lindsay, Ontario K9V 5N4	Phone 705-324-7378 Fax 705-324-9729 pgp_pest@lindsaycomp.on.ca
Mr. Dave Harper	LO - Garden Centres	Harper's Gardening Centre 1039 Wilson St., R.R. #3 Ancaster, Ontario L9H 5E3	Phone 905-648-2147 Fax 905-528-7890
Mr. Joe Sebastiao	LO - Grounds Mgmt	Aldershot Landscape Contractors 166 Platt Road Burlington, Ontario L7R 3X5	Phone 905-825-1802 Fax 905-689-3433
Mr. Phil Charal	LO - LDSCP Contractors	Allweather Landscape Co. Ltd. 77 Jonesville Cresc. Toronto, Ontario M4A 1H2	Phone 416-751-6821 Fax 416-751-8244 allweather@interlog.com
Mr. Bill Putzer	LO - Growers Group	M. Putzer (Hornby) Nurseries 7314 Sixth Line Hornby, Ontario L9P 1E0	Phone (905) 878-7226 Fax (905) 878-8737

Mr. Bill MacDonald	LO - Irrigation Group	Angus Inground Sprinkler Co. Box 81330 Fiddlers Green Road Burlington, Ontario L9G 4X2	Phone 905-627-3711 Fax 905-627-9177 billmac@skyline.net
Industry	International Soc. of Arboriculture	c/o Plant Products Co. Ltd 314 Orenda Road Brampton, Ontario L6T 1G1	Phone 905-793-7000 Fax 905-793-9157
Mr. Brad McDonald	Sports Turf Association	C/o Guelph Turfgrass Institute 328 Victoria Road S. Guelph, Ontario N1H 6H8	Phone 519-824-4120 Fax 519-766-1704
Dr. Bob Sheard	LO Horticultural Trades Foundation	c/o Landscape Ontario 7856 Fifth Line South RR #4, Stn Main Milton, Ontario L9T 2X8	Phone 905-875-1805 Fax 905-875-0183
Foundations	Ontario Turfgrass Research Foundation	G.M. Frost Research and Information Centre 328 Victoria Road S. Guelph, Ontario N1H 6H8	Phone 519-767-5009 Fax 519-766-1704
Mr. Barry Benjamin			
Mr. Ted Thom			

POTATO

Eugenia Banks
Chair

Ebanks@Omafra.gov.on.ca

Food Science Bldg
University of Guelph
Guelph

Becky Hughes
Vice Chair

Bhughes@onlink.net

New Liskeard Agricultural
Res. Station, Box 4020,
340 Armstrong St.
New Liskeard ON, P0J 1P0

Sam Squire
Secretary

Sam.Squire@sympatico.ca

Ont. Seed Potato Growers'
Assoc.
109 Hutchinson Dr
Alliston, ON, L9R 1M4

Rick Bailey

Fax: (705) 435-3365

Ont. Seed Potato Growers'
Assoc.
P. O. Box 109
Everett, ON, L0M 1J0

Murray Becker

Beckers@vianet.on.ca

Becker's Seed Potatoes
RR1 Trout Creek, ON

Paul Brine

Pbrine@Omafra.gov.on.ca

OMAFRA, ERLD
1 Stone Rd W
Guelph, ON, N1G 4Y2

Don Brubacher

Ontario Potato Board
485 Washington St
Elora, ON, N0B 1S0
Fax: (519) 846-8803

Vanessa Currie			Dept. of Plant Agriculture. Univ. of Guelph Guelph, ON, N1G 2W1	<u>Vcurrie@uoguelph.ca</u>
Walter Davidson	W.D. Potato Ltd		RR 2, Beeton, ON, L0G 1A0	
Wayne Dorsey	Ontario Potato Board		RR 4 Cookstown, ON, L0L 1L0	<u>Dorsey@accglobal.net</u>
Paul Downey	Industry		RR 6 Shelburne, ON, L0N 1S0	Fax: (905) 729-0839
Blake Irwin	Industry		RR 2 Shelburne, ON, L0N 1S6	
George Kotulak	Potato Grower		735 Hwy 77 Leamington, ON, N8H 3V8	
George Lazarovits	AAFC		1391 Sandford Drive London, ON, N5V 4T3	<u>Lazarovits@em.agr.ca</u>
<u>James Lundy</u>	Industry		9 Wales St Everett, ON, L0M 1J0	
David MacKenzie	Potato Grower		RR 4, Alliston, ON, L9R 1V4	
Alex Marangoni	<u>Food Science Dept</u>		Univ. of Guelph Guelph, ON, N1G 2W1	

Kevin Marcoux	Ontario Potato Board	485 Washington St Elora, ON, N0B 1S0	Fax: (519) 846 8803
Mark Sears	Environmental Biology Dept.	Univ. of Guelph Guelph, ON, N1G 2W1	
Glen Squirrel	Potato Grower	RR 2 Shelburne, ON, L0N 1S6	
Alan Sullivan	Dept of Plant Agriculture	Univ. of Guelph Guelph, ON, N1G 2W1	Asullivan@evbhort.uoguelph.ca
Richard Tarn	<u>AAFC</u>	Potato Research Center P.O. Box 20280 Fredericton, NB, E3B 4Z7	Tarnr@em.agr.ca
John Vander Burgt	Private Consultant	RR 1 Dashwood, ON, N0M 1N0	
John Vander Zaag	Ont. Seed Potato Growers' Assoc.	RR 3 Alliston, ON, L9R 1V3	
Kate Vander Zaag	<u>Industry</u>	RR 3 Alliston, ON, L9R 1V3	
Peter Vander Zaag	Canadian Private Potato Breeders' Association	RR 3, Alliston, ON, L9R 1V3	
Murray Williamson	W.D. Potato Ltd	RR 2 Beeton, ON, L0G 1A0	

Rick Yada

Food Science Dept. U. of G
Guelph, ON, N1G 2W1

SWEET CORN

Keith Strang

OVGMB

435 Consortium Crt
London
N6E 2S8

(519) 681-1875

Peter Welsh

Grower

R.R. #3
Scotland
N0E 1R0

(519) 446-2408

Bob Allison

Grower

R.R. #2
Georgetown
L7G 4S5

(905) 873-8283

Howard Herrie

Grower

R.R. #1
St. Agatha
N0B 2L0

(519) 886-7576

Ralph Corrigan

Grower

R.R. #1
Cookstown
L0L 1L0

(705) 458-9508

Chris Chechak	Stokes Seeds Ltd.	Box 10 St. Catharines L2R 6R6	(905) 688-4300
John Zink	Asgrow Seed Co.	107 Highview Ave. W London N6J 4C6	(519) 680-9901
Fred Fuller	Fred Fuller Seeds Ltd.	R.R. #1 Kettleby L0Q 1J0	(905) 775-9696
Alan Cyster	Family Traditions Foods	P.O. Box 3220 Tecumseh N8N 2C5	(519) 735-2111
Paul Logan	Strathroy Foods	P.O. Box 188 Strathroy N7G 3J2	(519) 245-4600
Barry Cavanagh	Strathroy Foods	P.O. Box 188 Strathroy N7G 3J2	(519) 245-4600 Ext. 223

George Foster	Cobi Foods Inc.	P.O Box 176 Ingersoll N5C 3K5	(519) 485-4410
Ron Pitblado	University of Guelph	Ridgetown College Ridgetown N0P 2C0	(519) 674-1605
Peter Sikkema	University of Guelph	Ridgetown College Ridgetown N0P 2C0	(519) 674-1603
John Zandstra	University of Guelph	Ridgetown College Ridgetown N0P 2C0	(519) 674-1627
Jay Strom	Grower	R.R. #7 Guelph N1H 6J4	(519) 822-1070
Keith McKenzie	Family Traditions Foods	Box 3220 Tecumseh N8N 2M4	(519) 735-2111

Bill Balkwill	Agriculture & Agrifood Can	Harrow N0R 1G0	(519) 738-2251
John Warner	Agriculture & Agrifood Can	Harrow N0R 1G0	(519) 738-2251
Wade Bickle	Nabisco Brands Ltd	210 Wellington St. Exeter N0M 1S2	(519) 235-2445
Joe Uyenaka	Stroller Canada	940 Shedden Ct. Burlington L7L 5K6	(905) 632-8503
Darryl Beschell	Predators-R-Us	34611 Creamery Rd., R.R. #3 Ailsa Craig N0M 1A0	(519) 293-3837
Elaine Roddy	OMAFRA	1 Stone Rd. W Guelph N1G 4Y2	(519) 826 3760
John Warner	AAFC	2085 County Rd 20.E. Harrow N0R 1G0	(519) 738-2251 Ext. 468

Randy Dennis	Novartis Seeds	Box 72 Oakfield NY 14125	(716) 948-8149
Al McKeown	University of Guelph	Box 587 Simcoe N3Y 4N5	(519) 426-7120
Ron Garton	Asgrow Vegetable Seeds	2770 Effingham Rd. St. Catharines L2R 6P7	(905) 682 8101
Becky Hughes	University of Guelph	P.O. Box 4020 New Liskeard P0J 1P9	(705) 647-8525
John O'Sullivan	University of Guelph	Box 587 Simcoe N3Y 4N5	(519) 426-7120
Greg Muscatt	Cuddy	R.R. #1 Melbourne N0L 1T0	(519) 668-5032
Peter Johnson-Beresford	University of Guelph	Kemptville College Kemptville K0G 1J0	(613) 258-8336

John Van der Burgt	Consultant	R.R. #1 Dashwood N0M 1N0	(519) 236-4025
Doug McCallum	Pineholm Farms	R.R. #7 Woodstock N4S 7W2	(519) 537-5136
Jim Howe	Family Tradition Food	P.O. Box 3220 Tecumseh N8N 2C5	(519) 735-2111
John Mcree	Townline Farms/ Processing	R.R. #1 Hillier K0L 2J0	(613) 399-2020
Kevin Miles	Miles Produce Ltd.	R.R. #1 Waterford N0E 1Y0	(519) 443-7227
Todd Cowan	Hruon Research Stn U of G	R.R. #1 Exeter N0K 1E0	(519) 235-4075
Michael Celetti	OMAFRA	Rm 3110 Bovey Bldg. U of G Guelph N1G 2W1	(519) 824-4120

Christoph Kessel	OMAFRA	Dept of LRS U of G Guelph N1G 2W1	(519) 824-4120 Ext 2480
Tiequan Zhang	GPCRC, AAFC	Harrow N0R 1G0	(519) 738-2251 Ext 476
<u>TENDER FRUIT</u>			
Anderson, Annette Chair, OHCRSC	OMAFRA	OMAFRA, 3 rd Floor 1 Stone Road, Guelph N1G 4Y2	519-826-3286 519-826-3567 annette.anderson@omafra.gov.on.ca
Bernard, Rhonda	Industry	Mori Nurseries, Ltd. RR 2, Niagara-on-the-Lake ON L0S 1J0	905-468-3218 905-468-7271 rhonda@morinurseries.com
Brine, Paul	OMAFRA	OMAFRA, 1 Stone Road, Guelph N1G 4Y2	519-826-4162 519-826-4211 pbrine@omafra.gov.on.ca
Brown, Daniel	AAFC	AAFC-SCPFRC, 1391 Sandford St London ON N5V 4T3	519-457-1470 Ext. 228 519-457-3997 browndc@em.agr.ca

Celetti, Michael	OMAFRA	Room 3110, Edmund C. Bovey Bldg U. of Guelph, Guelph, Ontario N1G 2W1	519-824-4120 Ext. 8916 519-767-0755 mceletti@omafra.gov.on.ca
Cline, John	U of G	U. of Guelph, Dept. Plant Agriculture Box 587, 1283 Blueline Road Simcoe, ON N3Y 4N5	519-426-7127 Ext. 331 519-426-1225 JCline@uoguelph.ca
Delanghe, Hector	OFTA	RR 1, Blenheim ON NOP 1A0	519-676-4475 905-676-1506
Derkacz, Maria	U of G	U. of Guelph, Dept. Plant Agriculture 4890 Victoria Avenue North, Box 7000 Vineland Station ON L0R 2E0	905-562-4141 Ext. 137 905-562-3413 mderkacz@uoguelph.ca
Dutchyn, Joe	Industry	Produce Link International 1099 Creek Road RR 2, Niagara-on-the-Lake ON L0S 1J0	330716 330718
Errampalli, Deena	AAFC	AAFC-SCFRC 4902 Victoria Avenue North, Box 6000 Vineland Station ON L0R 2E0	905-562-4113 Ext. 234 905-562-4335 errampallid@em.agr.ca

Evans, Karl	Industry	Nabisco Ltd. Box 40, 329 Creek Road St. Davids ON L0S 1P0	905-262-4211 905-262-4087 kevans@nabisco.ca
Ferguson, Blake	CFIA	457 Richmond Street, Room 404 London, ON N0M 2A0	fergusonb@em.agr.ca
Fraser, Hannah	OMAFRA	OMAFRA 4890 Victoria Ave. N., Box 8000 Vineland Station ON L0R 2E0	905-562-1674 905-562-5933 hannah.fraser@omafra.gov.on.ca
Fraser, Hugh	OMAFRA	OMAFRA 4890 Victoria Avenue North, Box 8000 Vineland Station, ON L0R 2E0	905-562-1618 905-562-5933 hfraser@omafra.gov.on.ca
Gadsby, Martin	AAFC	AAFC-GPCRC Harrow ON N0R 1G0	519-738-2251 Ext. 436 519-738-2929 gadsbym@em.agr.ca
Garrett, Jim	Industry	Mori Nurseries, Ltd. RR 2, Niagara-on-the-Lake ON L0S 1J0	905-468-3218 905-468-7271 jim@morinurseries.com

Greensides, Tom	Industry	471 Ridge Rd. W Grimsby ON L3M 4E7	905-687-2033 905-945-3427 tgreensides@uap.ca
Huffman, Leslie	OMAFRA	OMAFRA, c/o Research Station Harrow, Ontario N0R 1G0	519-738-2251 Ext. 499 905-738-2929 lhuffman@omafra.gov.on.ca
Huisman, Adrian	OTFAC	OTFPMB, Box 100 Vineland Station ON L0R 2E0	905-688-0990 Ext. 236 905-688-5915 grapeont@vaxxine.com
Hunter, David Chair	AAFC	AAFC-SCPFRC 4902 Victoria Avenue North, Box 6000 Vineland Station ON L0R 2E0	905-562-4113 Ext. 228 905-562-4335 hunterda@em.agr.ca
Ker, Kevin	Consultant	KCMS Consultants 5 Park Rd. N. Grimsby ON L3M 2P2	905-945-8228 905-945-2144 kcms@sympatico.ca
Kessel, Christoph	OMAFRA	OMAFRA, c/o U. of Guelph Guelph ON N1G 2W1	519-824-4120 Ext. 2480 519-824-5730 ckessel@omafra.gov.on.ca

Lay, William (Bill)	U of G	U. of Guelph, Dept. Plant Agriculture 4890 Victoria Avenue North, Box 7000 Vineland Station ON L0R 2E0	905-562-4141 Ext. 129 905-562-3413 wlay@uoguelph.ca
Leenaars, Audie	OFTA	c/o OTFPMB, Box 100 Vineland Station, Ontario, L0R 2E0	905-688-0990 905-688-3211
Luffman, Margie	AAFC	Canadian Clonal Gene Bank AAFC-GPCRC, Harrow ON N0R 1G0	519-738-2251 Ext 474 519-738-2929 luffmanm@em.agr.ca
McFadden-Smith, Wendy	Brock	Brock U., Dept. Biological Sciences, St. Catharines, ON L2S 3A1	905-688-5550 Ext 4814 (905) 688-1855 wmcfadde@spartan.ac.brocku.ca
Miles, Neil	U of G	U. of Guelph, Dept. Plant Agriculture 4890 Victoria Avenue North, Box 7000 Vineland Station ON L0R 2E0	905-562-4141 Ext. 138 905-562-3413 nmiles@uoguelph.ca
Northover, John	AAFC	AAFC-SCPFRC 4902 Victoria Avenue North, Box 6000 Vineland Station ON L0R 2E0	905-562-4113 Ext. 224 905-562-4335 northoverj@em.agr.ca

Pree, David, J.

AAFC

AAFC-SCFRC
4902 Victoria Avenue North,
Box 6000
Vineland Station ON L0R
2E0
905-562-4113
Ext. 226
905-562-4335
preed@em.agr.ca

Len Troup

OTFPMB

OTFPMB, Box 100
Vineland Station ON LOR
2E0
905-688-0990
905-688-3211

Roberts, Wayne
Vice-Chair

OTFPMB

OTFPMB, Box 100
Vineland Station ON L0R 2E0
905-688-0990
Ext. 235
905-688-3211
grapeont@vaxxine.com

wroberts@landscapeontario.com

Skog, Lisa

U of G

U. of Guelph, Dept. Plant
Agriculture
4890 Victoria Avenue North,
Box 7000
Vineland Station ON L0R
2E0
905-562-4141
Ext. 183
905-562-3413
lskog@uoguelph.ca

Slingerland, Ken

OMAFRA

OMAFRA
4890 Victoria Avenue North,
Box 8000
Vineland Station ON L0R
2E0
905-562-1639
905-562-5933
kslinger@omafra.gov.on.ca

Smith, Jennifer	Industry	Biggar's Frosted Food 4230 Victoria Ave Vineland Station ON L0R 2E0	905-562-4337
Smith, Rusty	OTFPMB	OTFPMB, RR #1 Blenheim ON N0P 1A0	519-676-8310 519-676-1797
Stobbs, Lorne	AAFC	AAFC-SCFRC 4902 Victoria Avenue North, Box 6000 Vineland Station ON L0R 2E0	905-562-4113 ext.241 905-562-4335 stobbsl@em.agr.ca
Svircev, Antonet	AAFC	AAFC-SCFRC 4902 Victoria Avenue North, Box 6000 Vineland Station ON L0R 2E0	905-562-4113 Ext.227 905-562-4335 svirceva@em.agr.ca
Warner, Torrie	NPFVGA OF&VGA	4045 John Street Beamsville ON L0R 1B1	905-562-5637 905-562-4512 twarner@vaxxine.com
Van Weerden, Peter	OMAFRA	OMAFRA, Food Inspection Branch 4890 Victoria Avenue North, Box 9000 Vineland Station ON L0R 2E0	905-562-1671 905-562-5639 pvanweer@omafra.gov.on.ca

Verhallen, Anne	OMAFRA	OMAFRA, c/o Ridgetown C.A.T. Ridgetown ON N0P 2C0	519-674-1614 519-674-1600 averhall@omafra.gov.on.ca
Walker, Gerry	OMAFRA	OMAFRA 4890 Victoria Avenue North, Box 8000 Vineland Station ON L0R 2E0	905-562-3833 905-562-5933 gwalker@omafra.gov.on.ca
Zandstra, John	U of G	U. of Guelph, Ridgetown College Ridgetown ON N0P 2C0	519-674-1627 519-674-1600 jzandstr@ridgetownc.uoguelph.ca
Zhou, Ting	AAFC	AAFC Food Research Program 93 Stone Rd W, Guelph, ON N1G 5C9	519-829-2400 Ext. 3118 519-829-2600 zhout@em.agr.ca